Iarnród Éireann
Irish Rail

Rosslare ORE Hub

EIAR Environmental Topic Chapters

Chapter 12:

Fish, Shellfish and Turtle Ecology

venterra | GDG GAVIN & DOHERTY GEOSOLUTIONS

NICHOLAS O'DWYER an RSK company

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LIST OF ABBREVIATIONS

AA	Appropriate Assessment
AQUAFACT	AQUAFACT International Services Ltd.
BIM	Bord Iascaigh Mara
CFD	Computational Fluid Dynamics
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
cSAC	Candidate Special Area of Conservation
cSPA	Candidate Special Protection Area
DAFM	Department of Agriculture, Food and the Marine
DAHG	Department of the Arts, Heritage and the Gaeltacht
DCCAE	Department of Communications, Climate Action and Environment
DECC	Department of the Environment, Climate and Communications
DHLGH	Department of Housing, Local Government and Heritage
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
EU	European Union
FRA	Fisheries Restricted Area
ICES	International Council for the Exploration of the Sea
IEMA	Institute of Environmental Management and Assessment
IFI	Inland Fisheries Ireland
IUCN	International Union for Conservation of Nature
IWDG	Irish Whale and Dolphin Group
JNCC	Joint Nature Conservation Committee
KER	Key Ecological Receptors
LoLo	Lift-On Lift-Off
MI	Marine Institute
MMO	Marine Mammal Observer
MSFD	Marine Strategy Framework Directive
NBDC	National Biodiversity Data Centre
NDP	National Development Plan
NHA	Natural Heritage Area
NIEA	Northern Ireland Environment Agency
NMPF	National Marine Planning Framework
NPWS	National Parks and Wildlife Service
NSA	Nutrient Sensitive Area
NTS	Non-Technical Summary
OPW	Office of Public Works
ORE	Offshore Renewable Energy
pNHA	Proposed Natural Heritage Area
PTS	permanent threshold shift
RFI	Request for Information
RoRo	Roll-on Roll-off

SAC	Special Area of Conservation
SCI	Site of Community Importance
SFPA	Sea-Fisheries Protection Authority
SPA	Special Protection Area
S-P-R	Source–Pathway–Receptor model
SSC	Suspended Sediment Concentration
UNCLOS	United Nations Convention on the Law of the Sea
WFD	Water Framework Directive
VP	Vantage Point
ZoI	Zone of Influence
AQUAFACT	AQUAFACT International Services Ltd.
CFD	Computational Fluid Dynamics
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MMO	Marine Mammal Observer
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12 FISH, SHELLFISH AND TURTLE ECOLOGY

12.1 INTRODUCTION

Iarnród Éireann – Irish Rail is applying for development permission for the Rosslare Offshore Renewable Energy Hub (hereafter the 'Proposed Development'), located immediately adjacent and to the northwest of the existing Rosslare Europort at Rosslare Harbour in County Wexford, which is operated by Iarnród Éireann. The Proposed Development includes capital dredging to achieve navigable depths for vessels delivering ORE components; land reclamation to create a storage area for these components; and construction of two new berths to facilitate loading and unloading of ORE components. The land reclamation works include infilling the existing small boat harbour, after the construction of a new small boat harbour. The Proposed Development also includes the installation of a new slipway and facility for local clubs, such as the Sea Scouts.

The purpose of the Proposed Development is to provide a facility for the efficient handling and storage, marshalling, staging and integration of ORE components to facilitate installation of offshore wind energy projects by ORE developers and operators. The Proposed Development is designed to provide facilities that accommodate a wide range of infrastructure uses, both for current requirements and anticipated future needs. For instance, the Proposed Development could be used for traditional port activities if required, including during periods of reduced ORE-related activity. Refer to EIAR Chapter 6: Project Description for further detail.

This chapter of the EIAR presents the assessment of the likely significant effects of the Proposed Development on fish, shellfish and turtle ecology arising from the construction and operation of the Proposed Development, both alone and cumulatively with other projects. The scope of this chapter was determined following issue of a scoping report to the following topic-relevant stakeholders (see Chapter 4 Scoping and Consultation for full details of consultation), which was issued to the following topic-relevant stakeholders:

- Bord Iascaigh Mara (BIM)
- Inland Fisheries Ireland (IFI)
- Marine Institute (MI)
- National Parks and Wildlife Service (NPWS)
- Sea Fisheries Protection Authority (SFPA)

This chapter provides a summary of relevant guidance and outlines the data sources used to characterise the Study Area for fish, shellfish and turtle ecology. Building on the general EIAR methodology outlined in Chapter 1: Introduction and Methodology, the methodology followed in assessing the impacts of the Proposed Development on these ecological receptors is set out, as is the assessment of likely effects arising from the construction and operation of the Proposed Development.

Specifically, the chapter:

a) Presents the existing fish, shellfish and turtle baseline established from available data, desk studies, and consultations.

b) Identifies any assumptions and limitations encountered in compiling this information.

c) Identifies those receptors that could be affected by the construction and operation of the Proposed Development.

d) Presents the potential environmental effects on fish, shellfish and turtle receptors arising from the Proposed Development, based on the information gathered, and the analysis and assessments undertaken.

e) Describes any necessary monitoring and/or mitigation measures which will be implemented to prevent, minimise, reduce or offset the possible environmental effects of the Proposed Development on fish, shellfish and turtle ecology.

The assessment presented is informed by the following technical chapters/appendices:

- EIAR Technical Appendix 12: Fish, Shellfish and Turtle Ecology (GDG, 2025) and EIAR Technical Appendix 15: Commercial Fisheries and Aquaculture (SMEC, 2025)
    - Presents baseline ecological information on marine teleosts, commercially important shellfish, and turtle species within the Study Area. It also compiles baseline data on local fisheries activity and aquaculture, drawing on literature review, desktop datasets (e.g., BIM, MI, SFPA), and site-specific benthic grab and drop-down video surveys. This information supports the identification of Key Ecological Receptors (KERs), characterises habitat use and species distributions, and informs the assessment of impact significance from both ecological and commercial perspectives.
- Chapter 15: Commercial Fisheries and Aquaculture (GDG, 2025)
    - Assesses interactions between the Proposed Development and fisheries activities. The spatial overlap of fishing grounds and fish ecology receptors informs potential pressure pathways such as displacement, gear conflict, or changes in fish availability.
- Chapter 8: Coastal Processes (GDG, 2025)
    - Evaluates sediment transport and coastal morphology changes arising from the Proposed Development. These processes underpin assessments of suspended sediment concentrations and potential smothering effects on fish habitats.
- Chapter 11: Benthic Ecology (GDG, 2025)
    - Describes the seabed habitats present and their ecological condition. This informs assessments of habitat loss, prey availability, and sensitivity of spawning or nursery habitats for demersal species.
- EIAR Technical Appendix 7: Hydrodynamic Modelling (GDG, 2024)

    - Presents predictions for current velocities, dispersion of suspended sediments, and deposition patterns. These outputs are essential for assessing spatial extent and magnitude of sediment-related impacts on fish and turtle receptors.

- EIAR Technical Appendix 11: Benthic Ecology (MERC, 2025)

    - Provides detailed baseline data on benthic invertebrate communities, sediment characteristics, and habitat classification. These data support the understanding of prey resources and habitat associations for fish and turtle species.

- EIAR Technical Appendix 13: Marine Mammal Ecology (Underwater Noise Modelling) (GDG & IWDG, 2025)

    - Contains modelled predictions of underwater sound from piling, dredging, and blasting activities. These results are applied to fish using thresholds adapted from Popper *et al*. (2014), supporting the assessment of auditory injury (or permanent threshold shift, PTS), temporary hearing shifts (or temporary threshold shift, TTS), and behavioural disturbance risks. Baseline ambient noise data recorded using a calibrated SoundTrap device is also included, confirming elevated background underwater noise levels within Rosslare Harbour due to ongoing vessel activity and port operations. This context is important when assessing the significance of additional underwater noise generated during construction and operation.

12.1.1 POLICY, LEGISLATION AND GUIDELINES

12.1.1.1 LEGISLATION

Table 12.1: Legislation

Publisher	Name of document including reference	Context
Minister for the Environment, Community and Local Government, 2011	European Communities (Marine Strategy Framework) Regulations 2011 (as amended)	This legislation transposes EU Marine Strategy Framework Directive (MSFD) (2008/56/EC), as amended by Commission Directive (EU) 2017/845, into Irish law. The Marine Strategy Framework Directive (MSFD) defines a set of environmental descriptors relevant to fish, shellfish and turtle ecology, including: Descriptor 1: Biological diversity is maintained. Descriptor 2: Non-indigenous species do not adversely alter the ecosystem. Descriptor 4: Elements of food webs ensure long-term abundance and reproduction. Descriptor 6: The sea floor integrity ensures functioning of the ecosystem. Descriptor 7: Permanent alteration of hydrographical conditions does not adversely affect the ecosystem.

Publisher	Name of document including reference	Context
		Descriptor 8: Concentrations of contaminants give no effects. Descriptor 10: Marine litter does not cause harm. Descriptor 11: Introduction of energy (including underwater noise) does not adversely affect the ecosystem.
Department of Housing, Local Government and Heritage (2021)	Maritime Area Planning Act 2021	This Act establishes a new legal framework for Ireland's maritime area. It regulates developments like offshore renewable energy projects and replaces the earlier Foreshore Acts (1933 - 2023). The legislation ensures that environmental assessments and the protection of ecological resources, including fish and marine life, are integrated into the consenting process.
Department of the Arts, Heritage and the Gaeltacht (DAHG), 1976	Wildlife Act 1976 as amended	This is a key piece of national legislation providing a legal basis for protecting and conserving wild species and their habitats, including aquatic and marine fauna.
The Minister for the Environment, Heritage and Local Government, 2003	European Communities (Water Policy) Regulations 2003 , as amended.	This document transposes European Communities (Water Framework Directive (WFD)) into Irish law. Requires all Member States to protect and improve water quality in all waters so that they achieve good ecological status by 2015 or, at the latest, by 2027. Fish are one of five biological quality elements to be assessed under the WFD. They are an important component of marine ecological systems and are effective indicators of certain types of disturbance or 'pressure'.
Minister for Communications, Climate Action and Environment, 2016	European Union (Framework for Maritime Spatial Planning) Regulations 2016 (S.I. No. 352/2016); S.I. No. 352/2016 - European Union (Framework for Maritime Spatial Planning) Regulations 2016. (irishstatutebook.ie)	Transposes European Union Directive 2014/89/EU (Marine planning framework) into Irish law, establishing a framework for maritime spatial planning to ensure sustainable management of marine activities.

12.1.1.2 RELEVANT POLICIES AND PLANS

Table 12.2: Planning Policies and Development Control

Publisher	Name of document including reference	Context
Department of the Environment, Climate and Communications (DECC), 2022	Strategic Environmental Assessment (SEA) of the Offshore Renewable Energy Development Plan (OREDPII) in Ireland: Environmental Report https://www.gov.ie/en/publication/71e36-offshore-renewable-energy-development-plan-ii-oredpii/#environmental-assessments	Contains the Appropriate Assessment (AA) screening process and SEA scoping report of the Maritime area associated with OREDPII. This resource has some important information on existing baseline conditions in the maritime area.
Department of the Environment, Climate and Communications (DECC), 2022	Offshore Renewable Energy Development Plan (OREDPII)	This plan is a key policy document that guides the development of offshore renewable energy in Ireland. Its strategic environmental assessment (SEA) provides valuable baseline environmental data for the maritime area, informing the planning and consenting process for new projects.
Department of Housing, Local Government and Heritage (DHLGH), 2021	National Marine Planning Framework (https://assets.gov.ie/static/documents/national-marine-planning-framework.pdf)	Biodiversity Policy 1: Proposals incorporating features that enhance or facilitate species adaptation or migration, or natural native habitat connectivity will be supported, subject to the outcome of statutory environmental assessment processes and subsequent decision by the competent authority, and where they contribute to the policies and objectives of this National Marine Planning Framework (NMPF). Proposals that may have significant adverse impacts on species adaptation or migration, or on natural native habitat connectivity must demonstrate that they will, in order of preference and in accordance with legal requirements: a) avoid, b) minimise, or c) mitigate significant adverse impacts on species adaptation or migration, or on natural native habitat connectivity.
DHLGH, 2021	National Marine Planning Framework (https://assets.gov.ie/static/documents/national-marine-planning-framework.pdf)	Biodiversity Policy 2: Proposals that protect, maintain, restore and enhance the distribution and net extent of important habitats and distribution of important species will be supported, subject to the

Publisher	Name of document including reference	Context
		outcome of statutory environmental assessment processes and subsequent decision by the competent authority, and where they contribute to the policies and objectives of this NMPF. Proposals must avoid significant reduction in the distribution and net extent of important habitats and other habitats that important species depend on
DHLGH, 2021	National Marine Planning Framework (https://assets.gov.ie/static/documents/national-marine-planning-framework.pdf)	Biodiversity Policy 4: Proposals must demonstrate that they will, in order of preference and in accordance with legal requirements: a) avoid, b) minimise, or c) mitigate significant disturbance to, or displacement of, highly mobile species.
DHLGH, 2021	National Marine Planning Framework (https://assets.gov.ie/static/documents/national-marine-planning-framework.pdf)	Biodiversity Policy 5: Proposals must demonstrate that they will avoid, minimise, or mitigate significant adverse impacts on marine or coastal natural capital assets, or if it is not possible, proposals should state the case for proceeding.
DHLGH, 2021	National Marine Planning Framework (https://assets.gov.ie/static/documents/national-marine-planning-framework.pdf)	Sea-floor and Water Column Integrity Policy 3: Proposals that protect, maintain, restore and enhance coastal habitats for ecosystem functioning and provision of ecosystem services will be supported, subject to the outcome of statutory environmental assessment processes and subsequent decision by the competent authority, and where they contribute to the policies and objectives of this NMPF. Proposals must take account of the space required for coastal habitats, for ecosystem functioning and provision of ecosystem services, and demonstrate that they will, in order of preference and in accordance with legal requirements: a) avoid, b) minimise , or c) mitigate for net loss of coastal habitat.
DHLGH, 2021	National Marine Planning Framework (https://assets.gov.ie/static/documents/national-marine-planning-framework.pdf)	Fisheries Policy 5: Proposals, regardless of the type of activity they relate to, enhancing essential fish habitat, including spawning, nursery and feeding grounds, and migratory routes should be supported. If proposals cannot enhance essential fish

Publisher	Name of document including reference	Context
		habitat, they must demonstrate that they will, in order of preference: a) avoid; b) minimise; c) mitigate significant adverse impact on essential fish habitat, including spawning, nursery and feeding grounds, and migration route d) If it is not possible to mitigate significant adverse impact on essential fish habitat, proposals must set out the reasons for proceeding
DHLGH, 2021	National Marine Planning Framework (https://assets.gov.ie/static/documents/national-marine-planning-framework.pdf)	Underwater Noise Policy 1: Proposals must take account of spatial distribution, temporal extent, and levels of impulsive and / or continuous sound (underwater noise) that may be generated and the potential for significant adverse impacts on marine fauna. Where the potential for significant impact on marine fauna from underwater noise is identified, a Noise Assessment Statement must be prepared by the proposer of development. The findings of the Noise Assessment Statement should demonstrably inform determination(s) related to the activity proposed and the carrying out of the activity itself. The content of the Noise Assessment Statement should be relevant to the particular circumstances and must include: • Demonstration of compliance with applicable legal requirements, such as necessary assessment of proposals likely to have underwater noise implications, including but not limited to Appropriate Assessment (AA), Environmental Impact Assessment (EIA), Strategic Environmental Assessment (SEA), Specific response to 'strict protection' requirements of Article 12 of the Habitats Directive in relation to certain species listed in Annex IV of the Directive, and Species protected under the Wildlife Acts. • An assessment of the potential impact of the development or use on the affected species in terms of environmental sustainability;

Publisher	Name of document including reference	Context
		• Demonstration that significant adverse impacts on marine fauna resulting from underwater noise will, in order of preference and in accordance with legal requirements be: a) avoided, b) minimised, or c) mitigated, or d) if it is not possible to mitigate significant adverse impacts on marine fauna, the reasons for proceeding must be set out. This policy should be included as part of statutory environmental assessments where such assessments require consideration of underwater noise.
DHLGH, 2021	Article 17 update to Ireland's Marine Strategy Part 2: Monitoring Programme (Article 11) 2021; https://assets.gov.ie/203341/f36b708f-6515-4515-995f-595b35ca58ef.pdf	Update to Ireland's Marine Strategy Part 2: Monitoring Programme (Article 11), under the MSFD, detailing how the country is monitoring the state of its marine waters.
National Parks and Wildlife Service (NPWS)	Ireland's 4th National Biodiversity Action Plan (NBAP) (2024; d424b166-763b-4916-8eba-8afff955c5e5.pdf (www.gov.ie)	The 4th NBAP sets the national biodiversity agenda for the period 2023-2030 through 5 strategic objectives.

12.1.1.3 GUIDELINES AND TECHNICAL STANDARDS

Table 12.3: Guidelines and Technical Standards

Publisher	Name of document including reference	Context
Department of Communications, Climate Action and Environment (DCCAE), 2018	Guidance on Marine Baseline Ecological Assessments & Monitoring Activities for Offshore Renewable Energy Projects (Parts 1); 2caa8f12-f1e7-4d76-ab34-19174ff5b9e6.pdf (www.gov.ie)	Provides technical guidance for the baseline data requirements and monitoring necessary to evaluate potential environmental impacts of offshore renewable energy projects in the marine area.
DCCAE, 2017	Guidance on Environmental Impact Statement (EIS) and Natura Impact Statement (NIS) Preparation for Offshore Renewable Energy Projects;	To assist developers in preparing EISs' and NISs' that may be required for development projects. More

Publisher	Name of document including reference	Context
	76533_6a82b451-e09f-483b-849e-07d4c7baa728.pdf	specifically, it sets out the type of information that needs to be provided and the assessment approach to be used.
Centre for Environment, Fisheries and Aquaculture Science (Cefas), 2012	Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects	Provides recommended best practice for survey design, baseline characterisation, data acquisition, and monitoring in marine environments for offshore renewable energy projects. Used as a key reference for spatial and temporal baseline requirements and quality control, particularly in UK and international EIA / EcIA contexts.
Chartered Institute of Ecology and Environmental Management (CIEEM), 2022	Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine	Sets out best practice for undertaking Ecological Impact Assessment (EcIA), including scoping, defining Zones of Influence, evaluation of ecological receptors, and assessment of impacts. Provides the recognised framework for ecological assessment in the UK and Ireland and underpins the methodology applied in this chapter.

12.2 ASSESSMENT METHODOLOGY

This section outlines the approach taken to assess the potential impacts of the Proposed Development on fish, shellfish and turtle ecology receptors.

The assessment has been undertaken through interpretation of baseline data informed by a review of relevant literature and websites, site-specific surveys, consultation and modelling, application of relevant legislation and use of professional judgement. The assessment has been based on the information provided in EIAR Technical Appendix 12 and within Chapter 6: Project Description of the EIAR.

For the purposes of this impact assessment on fish, shellfish and turtle ecology, the CIEEM (2024) guidelines and EPA (2022) guidelines have been considered for the basis of the assessment. Standard impact assessment terms have been used, where appropriate, to provide consistency with the other assessments in this EIAR, refer also to Chapter 1: Introduction and Methodology. Professional judgement has been used to determine potential environmental impacts which could arise during the construction and operational phases of the Proposed Development.

The methodology of the assessment focuses on evaluating the significance of impacts of the Proposed Development for the species being considered, rather than solely the conservation importance of the species itself, though this remains an influencing factor in the evaluation. The level of use by the species—such as the number of individuals and the type and intensity of their activity at the Proposed Development—is considered. The site's value to the species is then assessed through a combination of data sources, expert judgment, and knowledge of both the site and the surrounding area.

The approach adopted is in line with CIEEM (2024) guidance and involves the following key steps:

- **Describing the Baseline**: Establishing current conditions and the presence, distribution, and ecological value of fish, shellfish and turtle receptors within the Zone of Influence (ZoI) of the Proposed Development (Section 12.4).
- **Identifying Key Ecological Receptors (KERs)**: Selecting receptors that are of sufficient conservation or ecological importance and likely to be within the zone of impact of the Proposed Development (Section 12.5.2).
- **Assessing Conservation Importance**: Evaluating each receptor's importance based on geographic context (e.g., local, county, national, international), legal protection, available ecological evidence (Section 12.5.2).
- **Characterising Impacts and their Effects**: Considering the nature, extent, duration, frequency, and reversibility of potential impacts arising from the construction and operation phases of the Proposed Development (Section 12.5.6 and 12.5.7).
- **Determining Significance**: Applying professional judgement to determine whether each impact is significant or not significant based on the conservation value of the receptor and the characteristics of the potential impact (Section 12.5.8).

- **Remedial and Mitigation Measures**: Identifying appropriate measures to avoid, reduce or offset significant impacts, and where relevant, proposing opportunities for ecological enhancement (Section 12.5 and Section 12.7).
- **Cumulative and Transboundary Effects**: Considering the effects of the Proposed Development in combination with other plans and projects, including potential transboundary effects (Section 12.6).
- **Residual Effects**: Evaluating the residual effects following the implementation of mitigation (Section 12.7.2).

The **Source–Pathway–Receptor (S-P-R)** model (OPR, 2021) has been used to guide the identification of likely impact pathways. If one of these elements is absent (e.g., a pathway is blocked or no receptor is present within the ZoI), then a significant ecological effect is unlikely, and the impact can be scoped out.

12.2.1 STATEMENT OF COMPETENCE

The chapter has been prepared by Maggie Starr (BSc. (Hons) Marine Sciences).

Maggie is lead author for the Fish, Shellfish and Turtle Ecology chapter. Maggie is a Marine Ecologist and Ornithologist with experience in terrestrial, aquatic and marine/coastal ecology and is a trained Marine Mammal Observer (MMO; Joint Nature Conservation Committee, JNCC, accredited). Her expertise includes specialised mammal, bird (land based and aerial) and habitat surveys, as well as freshwater surveys such as assessments for white-clawed crayfish, pearl mussel, and Biotic Indices (Q-values) Surveys. Her current work includes ecological and environmental desktop studies for terrestrial, aquatic and marine environments, specialised in mammal surveys, ornithological surveys, map preparation and reporting (AA/NIS, Preliminary Ecological Appraisal, and Ecological Impact Assessment, and EIAR).

This chapter has been reviewed by Catarina Aires (BSc (Hons) in Marine Biology, MSc in Ecology and Marine Conservation). Catarina is a Senior Marine Environmental Scientist with a background in marine regulation and extensive experience in environmental assessment and consenting. She has worked across the public and private sectors, delivering high-quality environmental reports, regulatory submissions and stakeholder engagement for a wide range of marine and coastal projects in Ireland, the UK, and internationally.

This chapter has been informed by EIAR Technical Appendix 12, prepared by Michael Keatinge (BA (Mod) Natural Science, MA Zoology, MSc Economics) and Maggie Starr. Michael has worked in the seafood/fisheries sector for more than 20 years. During that time, he has held a variety of positions including statistician and population modeller in the Fisheries Research Centre (Dept of Marine and Natural Resources) and, later, the Marine Institute; at various times he has been Director of Fisheries Development, Training Services and Economics and Strategic Services at Bord Iascaigh Mhara, Ireland's Seafood Development Agency.

12.2.2 CONSULTATION

As detailed in Chapter 4: Scoping and Consultation, stakeholder consultation has been an integral part of the Environmental Impact Assessment (EIA) process and has contributed to shaping the scope of the baseline characterisation and impact assessment for fish, shellfish and turtle ecology receptors.

As part of the EIA scoping process, the EIA Scoping Report was issued to the following topic-specific stakeholders in February 2023:

- Bord Iascaigh Mara
- Inland Fisheries Ireland
- Marine Institute
- National Parks and Wildlife Service
- Sea Fisheries Protection Authority

Following issue of the EIA Scoping Report, consultation meetings took place with key stakeholders including by phone with National Parks and Wildlife Service (NPWS) on 4th September 2023. In relation to shellfish, NPWS advised that a sufficient number and coverage of grab samples should be taken as part of the benthic ecology survey to robustly characterise the benthic infaunal communities present. Accordingly, the project team updated the benthic ecology survey design in October 2023 to ensure sufficient number and coverage of grab samples taken (increased from 20 to 40 stations, with 4 grabs at each station), as well as seabed imagery transects and water samples.

The pre-development consent application consultation process was undertaken between December 2023 and December 2024, and included engagement and consultation with An Bord Pleánala, NPWS, the Wexford County Council Biodiversity Officer and the Irish Whale and Dolphin Group (IWDG).

No specific concerns or detailed comments were raised in relation to fish or turtle ecological receptors. Nonetheless, the feedback informed the overall approach to marine ecological assessment and supported the inclusion of desk-based data sources and impact categories relevant to these receptors, with IWDG providing access to sighting records which have informed the baseline for this chapter.

As detailed in Chapter 15: Commercial Fisheries and Aquaculture of this EIAR, the Rosslare Harbour Fisheries Consultative Group was established in February 2024. The group is comprised of local and regional fisheries, aquaculture, and professional charter boat interests and has acted as the principal communications and discussion forum for the local commercial fisheries and aquaculture sectors and the Project Team. The Group has met regularly throughout the development of the Proposed Development, both in person and online and members of the group have provided valuable data regarding local fish and shellfish stocks which have also informed the baseline for this chapter.

12.2.3 ECOLOGICAL VALUE EVALUATION AND ASSIGNMENT OF KEY ECOLOGICAL RECEPTORS

A large number of fish, shellfish, and turtle species are known or expected to occur within the Study Area. Given the diversity of species and the varying degrees of data availability, it is not practical or meaningful to assess each individual species in detail. Therefore, in accordance with CIEEM (2024) guidance, a receptor-based approach has been adopted. Ecological receptors are evaluated for their geographical importance, sensitivity, and potential for significant effects, and only those meeting these criteria are carried forward as Key Ecological Receptors (KERs) for detailed assessment, as outlined further in Section 12.5.2.

While marine turtles and basking sharks (*Cetorhinus maximus*) are strictly protected under the EU Habitats Directive and Irish national legislation (e.g., Wildlife Acts, as amended, and the Third Schedule), and numerous fish species are of commercial or conservation concern, the identification of KERs for this assessment was based not only on legal status but also on their site-specific relevance and potential sensitivity to the Proposed Development.

KER assignment was informed by a desk-based review, species records, survey results, stakeholder consultations and professional ecological judgement. These inputs were used to identify those fish, turtle, and shark species most relevant to the assessment of construction and operational effects associated with the Proposed Development.

Where species occur at very low density, or where no spatial or ecological overlap with the Zone of Influence has been identified, they may not be carried forward as KERs. However, by assessing representative species within each ecological group, the assessment remains robust and inclusive of all relevant receptors potentially affected by the Proposed Development.

It should be noted that likely significant effects on European sites are addressed separately in the Appropriate Assessment Screening Report and, where applicable, the Natura Impact Statement (NIS).

To evaluate the ecological importance of the Proposed Development Boundary for fish, basking sharks, and turtles, the following factors were considered:

- **Level of Use:** This includes the number and species of individuals recorded, the frequency and seasonality of their presence, and the intensity of use (e.g., feeding, migration, spawning, or nursery activity).
- **Type of Activity:** The specific ecological behaviours exhibited within the zone, such as foraging behaviour in pelagic fish, migratory transit in diadromous species, or seasonal basking in *C. maximus*.
- **Site Value to Species:** An integrated understanding of how the site contributes to the ecological requirements of each receptor group, based on baseline data, expert interpretation, and the known distribution of species within the wider Irish Sea and Celtic Sea region.

This methodology ensures the assessment focuses on receptors most at risk of being impacted, and places emphasis on the ecological function of the site rather than solely the presence or protection status of individual species.

12.2.4 CHARACTERISING AND DESCRIBING IMPACTS

Each potential impact has been described and characterised using the following parameters:

1. **Nature of the Effect**: Whether the effect is likely to be positive, negative, or neutral.
2. **Extent and Context**: The geographical area affected (i.e., zone of impact) and its ecological context.

3. **Probability of Occurrence**: The likelihood that the impact will occur based on current knowledge and project information.
4. **Duration and Frequency**: The time period over which the impact will occur and how often.
5. **Reversibility**: Whether the impact is reversible and, if so, over what timescale.
6. **Magnitude of Change**: The scale of the predicted impact in terms of population, distribution, or ecological function.
7. **Cumulative Effects**: Consideration of the additive or synergistic effects of the Proposed Development in combination with other activities.

These characteristics are used to make a professional judgement about whether the identified effect will have a **significant** or **not significant** impact on the receptor, taking into account the integrity of habitats and the conservation status of species.

Additionally, as outlined in 12.2.7, consideration is given to any **primary mitigation measures** that are integrated within the project design and are intended to prevent, reduce, or where possible, offset significant adverse effects on the receiving environment, and **tertiary mitigation measures** that are required regardless of the EIA assessment. These primary and tertiary mitigation measures are described below, and further details regarding primary mitigation measures can be found in Chapter 6: Project Description of this EIAR.

12.2.5 SENSITIVITY OF RECEPTORS

The sensitivity of receptors has been assessed based on their capacity to tolerate specific pressures, their ability to recover to pre-impact conditions, and the ecological or conservation importance of the receptor. In this context, tolerance refers to the degree to which a species or population is susceptible to physical, acoustic, or behavioural disturbance, such as noise injury, habitat degradation, or changes in water quality. Recoverability reflects the ability of the receptor to return to baseline ecological conditions following disturbance, which depends on life history traits (e.g., generation time, migration patterns, spawning behaviour), population status, and the scale of the impact.

This sensitivity assessment has been informed by the best available scientific evidence, including peer-reviewed literature, conservation status assessments, and empirical data from comparable coastal and marine infrastructure projects (e.g., port expansions, dredging, and offshore renewables). Particular attention has been given to receptors of known sensitivity or legal protection, such as diadromous fish (e.g., Atlantic salmon, sea lamprey, and European eel), protected marine reptiles (e.g., loggerhead turtle), and basking shark, all of which exhibit specific ecological sensitivities to underwater noise, sedimentation, or barriers to migration.

The assessment combines professional judgement with receptor-specific evidence to determine sensitivity ratings, which then inform the evaluation of potential impacts during the construction and operational phases. These ratings are considered in conjunction with the magnitude of change to determine whether effects are likely to be **significant** or **not significant**.

12.2.6 IMPACT SIGNIFICANCE

A **significant** effect is one that is likely to affect:

- The structure and functioning (i.e. ecological integrity) of a population, habitat, or ecosystem, or
- The conservation status of a species or habitat, including its extent, abundance, and distribution.

Conversely, an effect is considered **not significant** if:

- It does not materially affect the conservation status or ecological integrity of a receptor, or
- The receptor is of low ecological value and/or the effect is of such low magnitude or duration that it would not result in a meaningful ecological consequence.

The assessment concludes on a binary basis - **significant** or **not significant** - to ensure clarity in decision-making. This approach is considered proportionate and aligned with best practice where potential impacts are either clearly negligible or where mitigation measures are integrated into the project design to effectively reduce impacts below the threshold of significance.

12.2.7 MITIGATION

As discussed in Chapter 1: Introduction and Methodology, three types of mitigation measures are considered in this chapter.

- Primary mitigation
- Secondary mitigation
- Tertiary mitigation

12.2.8 RESIDUAL EFFECTS

Where relevant, residual effects have been determined for each significant effect, considering all proposed mitigation. In cases where residual uncertainty of impact is identified within the EIAR, or the success of implemented mitigation measures requires validation, commitments have been made for the provision of monitoring.

12.2.9 DIFFICULTIES AND UNCERTAINTIES

The assessment presented in this chapter is based primarily on a desk-based review of existing literature, databases, and datasets from regional surveys, including the ObSERVE aerial survey programme, relevant EIA documentation from comparable developments and site-specific surveys.

Where species-specific data were unavailable, assessments were based on reasonable assumptions regarding habitat suitability, life history traits, and known distributions from similar coastal and port environments. Limitations are also acknowledged in relation to data on turtle presence and behaviour in Irish waters, which remains sparse and relies on opportunistic sightings.

Recent scientific reviews have emphasised the need to assess underwater noise impacts on fishes and invertebrates independently from marine mammals, due to fundamental differences in anatomy, acoustic sensitivity, and behavioural response (Hawkins and Popper, 2017). Unlike marine mammals, fishes and shellfish primarily detect underwater sound through particle motion, not just sound pressure. Widely used acoustic metrics, like sound pressure level (SPL) and cumulative sound exposure level (SELcum), may not accurately reflect biologically relevant exposure for these species.

Seabed-coupled interface waves (e.g., "ground roll") generated by piling and similar activities can produce elevated levels of particle motion over considerable distances, with particular implications for benthic invertebrates and demersal fish. These effects may result in behavioural disruption, physiological stress, masking of ecologically important cues, or, in some cases, physical injury. As such, this assessment draws on the best available guidance (Popper *et al*., 2014; Hawkins and Popper, 2017) to address these complexities and explicitly acknowledges the remaining data gaps and scientific uncertainties related to particle-motion-sensitive species.

Despite these limitations, the assessment is considered robust and precautionary. It draws on the best available scientific evidence and uses conservative assumptions where appropriate to ensure the findings are reliable.

This approach is consistent with the requirements of the EIA Directive (2014/52/EU) and associated Irish legislation to identify and transparently report assessment limitations and uncertainties.

12.3 DATA SOURCES

This section identifies the data sources which have informed the assessment. A combination of project-specific survey data, statutory datasets, and peer-reviewed scientific literature was used to characterise the baseline environment and to inform the evaluation of potential impacts

12.3.1 DESK STUDY

Information on fish, shellfish and turtle ecology within the study area was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 12.4.

Table 12.4: Summary of key desktop reports and datasets

Data Source	Type of Data	Temporal and Spatial Coverage
Published survey data covering the wider region		
ObSERVE Phase I Aerial surveys (Rogan *et al.,* 2018)	Published Report	Aerial surveys from 2015 to 2017, providing year-round temporal coverage of fish and turtle populations off Ireland's coast. Spatially, the surveys encompassed key offshore regions, including the Celtic Sea, Irish Sea, and deep waters of the Porcupine Basin and Rockall Trough, focusing on monitoring cetaceans, large fishes and other marine megafauna including

Data Source	Type of Data	Temporal and Spatial Coverage
		turtles to support conservation efforts. This report was used to provide context for the wider Irish Sea, including abundance estimates where possible.
ObSERVE Phase II Aerial surveys (Giralt Paradell *et al.*, 2024)	Published Report	Aerial surveys from 2021 to 2023, providing updated seasonal and spatial coverage of fish and turtle populations within Ireland's Exclusive Economic Zone. Spatially, the surveys encompassed coastal and offshore regions, including the Irish Sea, Celtic Sea, and Atlantic Margin. These surveys focused on refining abundance and distribution estimates for cetaceans, seabirds, large fishes and other marine megafauna including turtles, while addressing previously under-surveyed areas. This report provided population data and trends, providing contemporary context for the Irish Sea and adjacent regions, including density and abundance estimates where possible.
National Biodiversity Database Centre	Online fish and turtle datasets for Ireland https://maps.biodiversityireland.ie/Species	Online database of historic and recent fish and turtle records from national atlases and other datasets. Information was used to provide details of fish and turtle species recorded in the vicinity of the Proposed Development.

12.3.2 SITE SPECIFIC SURVEYS

A summary of the site-specific benthic ecology surveys used to inform the fish and shellfish ecology baseline for the Proposed Development is outlined in Table 12.5.

Benthic subtidal and intertidal surveys undertakenincluded subtidal grab sampling for macrofauna, including shellfish, and sediment characterisation, high-definition drop-down video transects, intertidal walkover surveys, and water sampling. Although primarily designed to classify benthic habitats and biotopes, these surveys provided records of demersal and benthopelagic species and define substrate types and habitat structures relevant to fish and shellfish ecology.

Marine mammal vantage point (VP) surveys (Chapter 13: Marine Mammals and EIAR Technical Appendix 13) were also capable of detecting large pelagic fish species, such as basking shark (*Cetorhinus maximus*), although no such species were recorded during the survey period. The absence of observations supports the conclusion that large pelagic fish species are infrequent within the Proposed Development site and surrounding waters during the monitoring period.

Given the absence of high-sensitivity spawning or nursery grounds within the immediate footprint of the Proposed Development, and the heavily modified nature of the port environment, the available site-specific data - in combination with the desktop study completed for this chapter (Chapter 12: Fish, Shellfish and Turtle Ecology) - were considered appropriate to inform a robust ecological baseline for fish and shellfish receptors.

Table 12.5: Summary of Site-Specific Surveys Informing the Fish, Shellfish and Turtle Ecology Baseline

Survey Type	Date(s)	Method Summary	Relevance to Fish, Shellfish and Turtle Ecology
Subtidal Grab Sampling	13th–15th February 2024	40 stations using 0.1 m^2 Day and mini-Hamon grabs; macrofauna, PSA, and TOC analysed	Provides incidental records of demersal and benthic-associated fish/shellfish species; informs sediment characteristics relevant to habitat preferences
Subtidal Drop-down Video Survey	18th–19th May 2024	HD video and stills captured along transects across sediment and cobble reef areas	Identifies substrate and biotope types; cobble reef and macroalgae presence informs habitat suitability for epifaunal and mobile fish species
Intertidal Walkover Surveys	10th October 2023, 27th May 2024	Meandering transects, SACFOR scoring, habitat/biotope mapping	Characterises intertidal habitats potentially used by juvenile or estuarine fish species
Water Quality Sampling	15th February 2024	CTD profiling and laboratory analysis at 15 stations	Confirms salinity and oxygenation conditions relevant to fish and shellfish physiology
Marine Mammal Vantage Point Surveys	July 2022–June 2023 (Year 1); September 2023–August 2024 (Year 2)	Fortnightly land-based visual surveys undertaken by IWDG from a VP west of Rosslare Europort over a 24-month period	While focused on marine mammals, surveys were capable of detecting large pelagic fish (e.g. basking shark); no large fish species were recorded
Ornithological Vantage Point Surveys (Second VP survey locations: VP2)	May 2022 – April 2023 (VP1); July 2023 – August 2024 (VP1); June – August 2024 (VP2)	Monthly 6-hour VP surveys for birds; incidental marine mammal sightings recorded, including during periods when dedicated marine mammal VP surveys were not conducted	Provides supplementary evidence of marine megafauna presence; capable of detecting large pelagic fish such as basking shark and ocean sunfish, though none were observed

12.3.3 SEDIMENT DISPERSION MODELLING

Dredging dispersion modelling was undertaken to assess the extent of potential suspended sediment concentration (SSC) increases and sediment deposition during the construction of the Proposed Development, refer to EIAR Technical Appendix 8. The modelling considered three sequential dredging and reclamation stages. Importantly, no sediment will be disposed of at sea; all dredged material will be reused within the reclamation area, with dispersion primarily occurring at the weir box outflow along the reclamation bund.

12.3.4 NOISE MODELLING

Noise modelling was undertaken to assess the potential for underwater sound generated during construction activities - specifically impact piling, dredging, and rock blasting - to affect fish species. The modelling compared predicted noise levels against injury thresholds defined in Popper *et al*. (2014), which remain the most comprehensive and widely applied criteria for assessing the impacts of underwater noise on fish. These thresholds distinguish between noise impacts on fish based on their swim bladder morphology and whether or not hearing may be affected. Fish eggs and larvae were also assessed separately due to their immobility and heightened vulnerability.

The noise modelling outputs, methodology, and assumptions are presented in detail in EIAR Technical Appendix 13: Underwater Noise of this EIAR.

The Sound Exposure Guidelines for Fishes and Sea Turtles (Popper *et al*., 2014) are considered to be most relevant for impacts of underwater noise on fish species (EIAR Technical Appendix 13: Underwater Noise). The Popper *et al*. (2014) guidelines broadly group fish into the following categories according to the presence or absence of a swim bladder and on the potential for that swim bladder to improve the hearing sensitivity and range of hearing (Popper *et al*., 2014):

- Group 1: Fishes lacking swim bladders (e.g., elasmobranchs and flatfish). These species are only sensitive to particle motion, not sound pressure and show sensitivity to only a narrow band of frequencies;

- Group 2: Fishes with a swim bladder but the swim bladder does not play a role in hearing (e.g., salmonids and some *Scombridae*). These species are considered to be more sensitive to particle motion than sound pressure and show sensitivity to only a narrow band of frequencies;

- Group 3: Fishes with swim bladders that are close, but not connected, to the ear (e.g., gadoids and eels). These fishes are sensitive to both particle motion and sound pressure and show a more extended frequency range than groups 1 and 2, extending to about 500 Hz; and

- Group 4: Fishes that have special structures mechanically linking the swim bladder to the ear (e.g., clupeids such as herring (*Clupea harengus*), sprat (*Sprattus sprattus*) and shads (*Alosa* spp.)). These fishes are sensitive primarily to sound pressure, although they also detect particle motion. These species have a wider frequency range, extending to several kHz and generally show higher sensitivity to sound pressure than fishes in Groups 1, 2 and 3.

12.4 FISH, SHELLFISH AND TURTLE ECOLOGY BASELINE

This section summarises current knowledge on abundance and distribution of fish, shellfish and turtle ecology within the Fish, Shellfish and Turtle Study Area. The characterisation of the current environment is established from a combination of benthic site survey results and desk-based resources.

The objective of this section is to present the best available understanding of the current baseline conditions for fish and marine turtle species within the Fish, Shellfish and Turtle Study Area. The fish, shellfish and sea turtle receptors that could be potentially impacted by the Proposed Development have been determined by the desktop review. This includes the identification and ecological characterisation of key species or species groups of relevance, with consideration given to their conservation status, ecological importance, and spatial and seasonal patterns of distribution. Spawning and nursery grounds, where identified, are described alongside known or potential migratory patterns of diadromous fish species. The section also identifies any relevant designated sites for fish species or habitats and includes reference to recent survey datasets (e.g., ObSERVE aerial surveys) and desk study sources used to inform the baseline. Through this process a number of fish species were identified as KERs.

12.4.1 STUDY AREA

The Study Area for the Fish, Shellfish and Turtle Ecology Chapter is defined as the geographical area within which a clear source–pathway–receptor link may exist between the Proposed Development and marine ecological receptors, namely fish, shellfish, sea turtles, and basking sharks. It includes all areas that may be directly or indirectly affected by the Proposed Development during the construction or operational phases, including potential effects arising from underwater noise, sediment dispersal, habitat disturbance, and barrier or displacement impacts.

To address both localised and wider ecological processes, two nested spatial units are defined (Figure 12.1):

- **Fish, Shellfish and Turtle Ecology Study Area:** This encompasses the footprint of the Proposed Development, including the 27.7 ha reclamation area and the 48.4 ha dredging area extending to -12 mCD. It also includes the surrounding nearshore marine environment potentially affected by tidal dispersion and construction activities. This area was delineated based on sediment dispersion modelling (see EIAR Technical Appendix 8: Coastal Processes)and reflects the maximum predicted extent of sediment dispersion as a result of dredging and reclamation activities. As detailed in Chapter 8: Coastal Processes, suspended sediment concentrations above background levels are predicted to extend approximately 1.5 km west and 2.5 km southeast along the shoreline from the Proposed Development Boundary.

- **Wider Contextual Study Area**: To interpret local impacts in a broader ecological and conservation context, a larger marine area is considered, covering the nearshore and offshore waters along southeastern Ireland. This encompasses key migratory corridors and feeding areas used by anadromous and catadromous fish species, sea turtles, and basking sharks within the western Irish Sea region. It provides context for assessing the regional ecological role of the site and its connectivity to designated conservation sites and wider fishery resources.

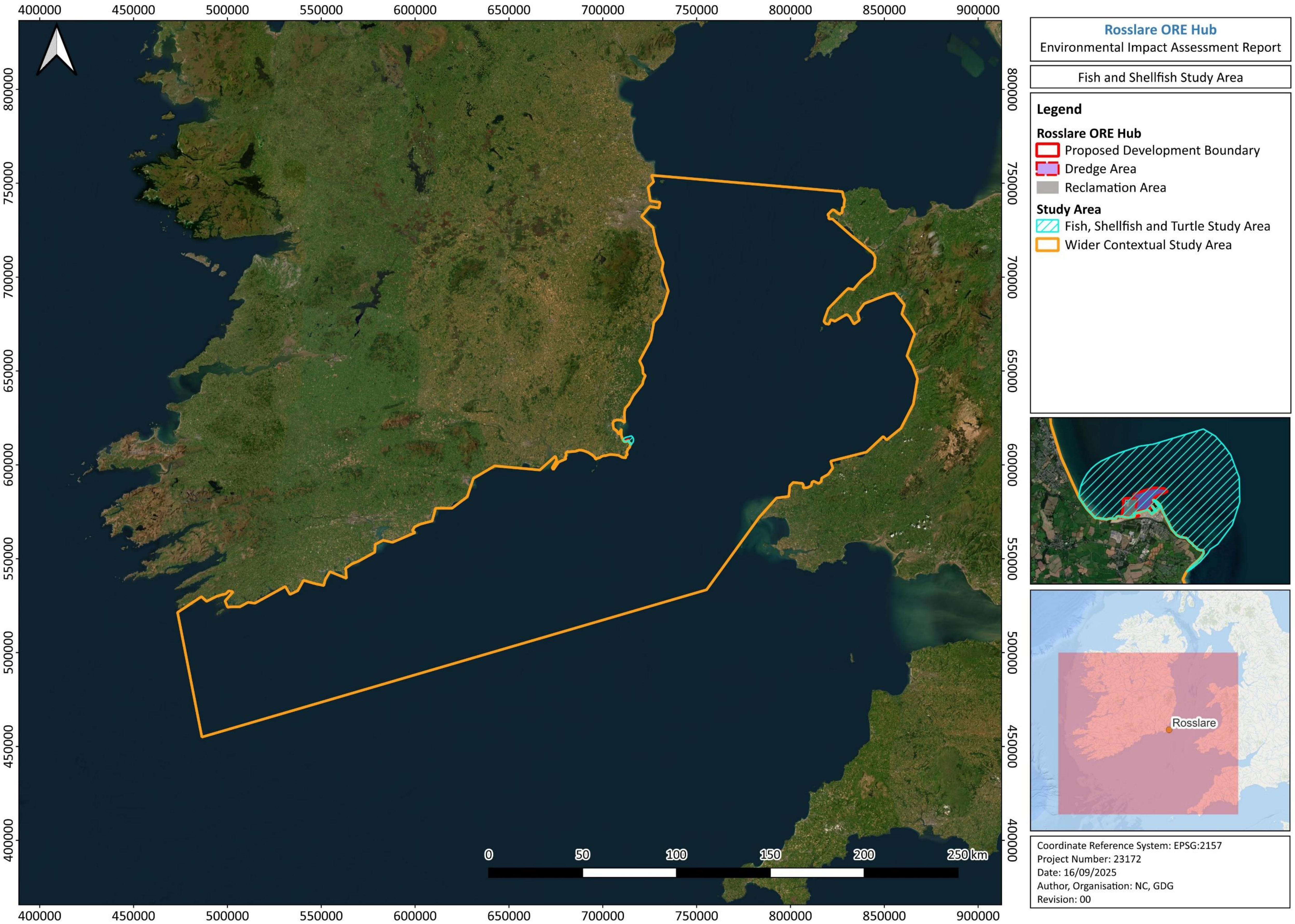

Figure 12.1: Fish, Shellfish and Turtle Ecology Study Area

12.4.2 EXISTING ENVIRONMENTAL CONDITIONS WITHIN ROSSLARE HARBOUR RELEVANT TO FISH, SHELLFISH AND TURTLE ECOLOGY

The Proposed Development is located within Rosslare Europort, a busy, long-operating commercial harbour that already supports high levels of human activity. The area has been heavily modified with man-made structures such as quay walls, breakwaters, slipways, and dredged channels. The seabed mainly consists of coarse or mixed sediments and artificial surfaces, which provide limited habitat value for fish or turtles that prefer more natural or complex seabed environments. Daily movements of ferries, cargo ships, and support vessels regularly disturb the water and sediment, leading to localised turbidity and disturbance of the seabed.

Site-specific benthic ecology surveys conducted in 2024, including subtidal grab sampling and drop-down video, confirm that the seabed within and surrounding the Proposed Development is dominated by coarse and mixed sediment types typical of a heavily modified port environment (refer to EIAR Technical Appendix 11). The most frequently recorded biotopes were *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand, and *Mediomastus fragilis* with cirratulids in mixed sediment. These assemblages are indicative of opportunistic, disturbance-tolerant communities with limited ecological sensitivity.

Patchy areas of subtidal reef were recorded along the southern and western survey extent, corresponding to the Annex I habitat “Reefs” (1170), but were overlain by mobile sediment and supported only sparse algal and faunal assemblages. Overall species richness and faunal biomass were moderate to low, with bivalves (*Abra alba*), polychaetes (*Nephtys hombergii*, *Cirriformia tentaculata*), and amphipods dominating the macrofaunal composition.

The absence of sensitive biogenic habitats (e.g., eelgrass beds, maerl), and lack of evidence for structured nursery habitats, suggest that the area provides only limited functional value for juvenile or spawning stages of fish or shellfish species. Intertidal surveys similarly identified low-diversity fucoid-dominated rocky shore communities, consistent with sheltered, urbanised coastal settings.

These findings support the conclusion that the habitat conditions within Rosslare Harbour are unlikely to support ecologically significant populations of fish or shellfish, and that any species utilising the area are likely to be mobile and opportunistic in nature.

Underwater noise levels in the harbour are already consistently elevated, as confirmed by baseline recordings from a SoundTrap device deployed between April and July 2024 (refer to Section 12.4.9). These recordings showed that low- to mid-frequency underwater noise - mainly from shipping and port operations - is a constant feature of the acoustic environment at Rosslare. As a result, any fish or turtle species present in or near the port are likely already used to this type of background noise.

12.4.2.1 OBSERVE AERIAL SURVEY STRATA (PHASE I AND PHASE II)

The most recent broad-scale dataset on the distribution of large fish and marine turtles in Irish waters was provided by Giralt Paradell et al. (2024) as part of Phase II of the ObSERVE aerial survey programme, which built upon the baseline established during Phase I by Rogan et al. (2018). Surveys were conducted across the Irish Exclusive Economic Zone (EEZ) using a Partenavia P-68 fixed-wing aircraft, flying at an altitude of 600 feet (183 m) and a groundspeed of 90–100 knots (167–185 km/hr).

Figure 12.2 and Figure 12.3 illustrate the survey strata and transect designs used during the ObSERVE Aerial Phase I and Phase II projects. These aerial surveys provided key baseline data on the occurrence, distribution, and abundance of large fish and marine turtle species—alongside cetaceans and seabirds—across Irish waters, including areas relevant to the Proposed Development.

In Phase I, survey blocks (Strata 1 to 5) were predetermined by the Department of Culture, Heritage and the Gaeltacht (DCHG) and the Department of Communications, Climate Action and Environment (DCCAE) to reflect national conservation and marine spatial planning priorities. Additional inshore strata (Strata 6 to 8) were surveyed in 2016–2017 to address data gaps during and after the SCANS-III survey (Hammond et al., 2017). Transects were designed using equally spaced zig-zag patterns, with randomised start points across survey years to reduce bias and improve seasonal representativeness.

Phase II (Giralt Paradell *et al*., 2024) comprised four seasonal aerial surveys (Summer 2021, Summer 2022, Winter 2022–2023, with Winter 2021–2022 cancelled due to a forced aircraft landing). The design included both offshore strata (1–4) and coastal strata: Stratum 5 (Irish Sea) and Strata 6A to 6C (north, west, and south coasts). Transect layouts varied by stratum, with zig-zag designs applied to most areas (Strata 1–5 and 6B), and parallel transects used in Strata 6A and 6C. Unlike Phase I, the same transect lines were repeated in each year to enable temporal comparisons.

This stratified and standardised design ensured broad spatial coverage and robust data collection critical for assessing offshore development impacts on marine megafauna, including fish and turtle species.

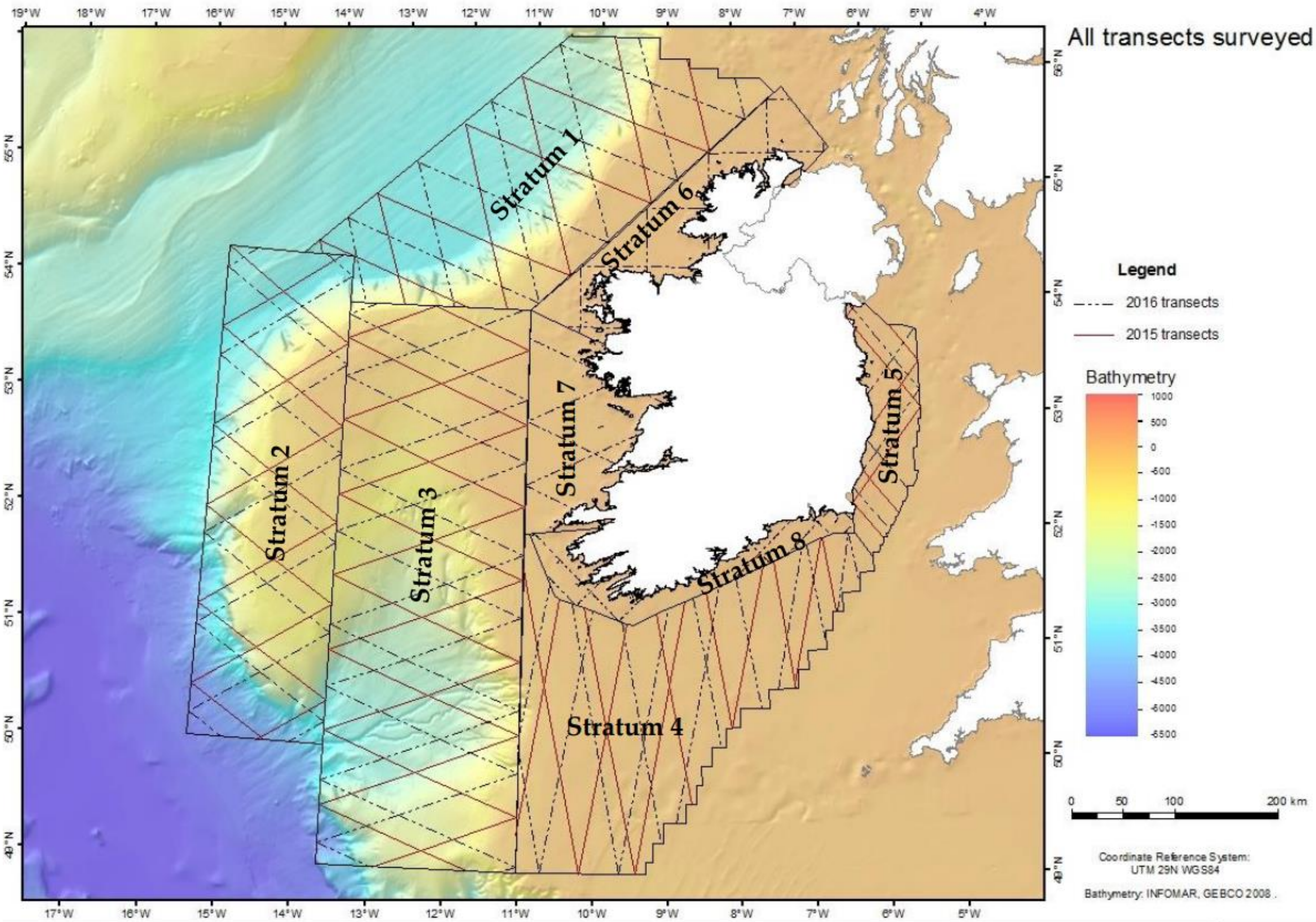

Figure 12.2: ObSERVE Aerial Phase I transect lines flown in summer and winter 2015 and 2016 in relation to bathymetry (from Rogan et al., 2018)

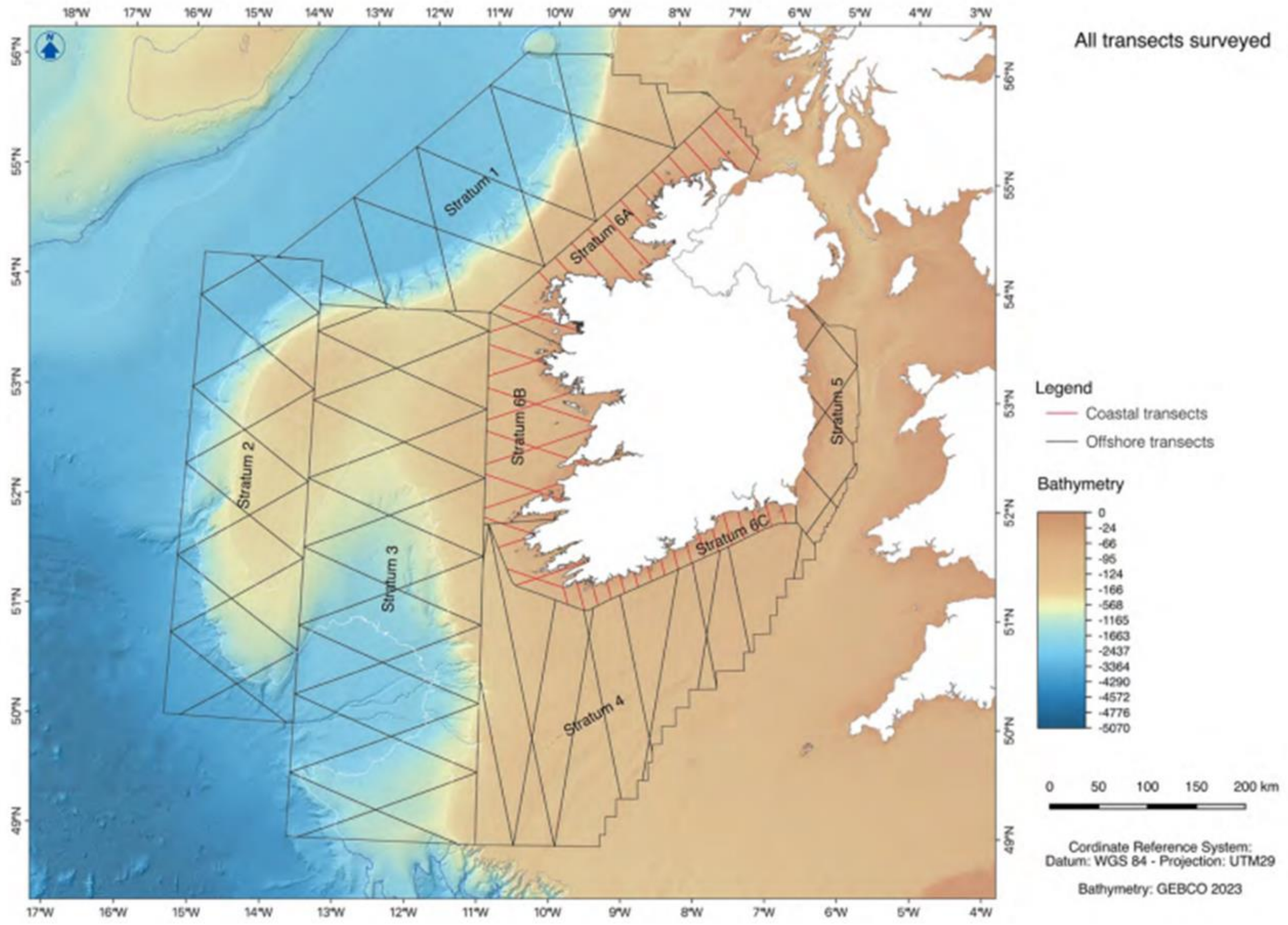

Figure 12.3: ObSERVE Aerial Phase II transect lines flown in summer 2021 and 2022 and winter 2022-2023 in relation to bathymetry. Black lines show the transect lines in offshore strata and red lines the transect lines in coastal strata (from Giralt Paradell et al., 2024)

12.4.3 MARINE TELEOSTS

This section addresses marine teleosts - bony fish species that occur within the marine environment of the Proposed Development. It includes both demersal species (e.g., cod *Gadus morhua*, whiting *Merlangius merlangus*) and pelagic species (e.g., sand smelt *Atherina presbyter*), which are either resident year-round or utilise the area seasonally for foraging, shelter, or movement. These species represent a broad functional group of ecological and commercial relevance, and many are well-adapted to dynamic coastal environments such as that at Rosslare Europort. The following subsections consider species of particular interest within this group, based on available records and literature.

12.4.3.1 OCEAN SUNFISH (*MOLA MOLA*)

The ocean sunfish (*Mola mola*) is a large, epipelagic species found in temperate and tropical oceans worldwide. It is the heaviest bony fish species, known for its distinctive body shape and primarily surface-oriented behaviour. Sunfish are non-migratory in the traditional sense, but they exhibit seasonal movements that correspond to changes in temperature, prey availability, and surface productivity (Pope *et al*., 2010). Their diet is dominated by gelatinous zooplankton, including jellyfish, salps, and ctenophores.

In Irish waters, ocean sunfish are typically seasonal visitors, with sightings largely restricted to summer months. Sunfish appear to favour highly productive shelf-edge and oceanic areas, although individuals occasionally move into more coastal waters during periods of peak surface productivity. Sunfish are generally observed as solitary individuals, with occasional small groups. They are known to spend long periods near the surface, possibly for thermoregulation, parasite removal, or foraging. Though considered a passive swimmer, tagging studies have revealed that ocean sunfish can undertake vertical movements to several hundred metres depth, especially outside the summer surface-feeding period (Hays *et al*., 2009).

While the species is not currently listed under Irish or EU conservation legislation, it is vulnerable to bycatch in pelagic fisheries and is considered Data Deficient by the IUCN due to limited understanding of its population trends and life history.

During the ObSERVE Phase II survey programme, the ocean sunfish were the most frequently sighted megafaunal species after cetaceans and seabirds, with 386 sightings comprising 434 individuals, recorded exclusively during summer months. Sightings occurred across all strata, with higher concentrations in continental shelf waters of the southern Porcupine Bank and around the Porcupine Seabight, and more sporadic records in eastern areas, including the Irish Sea (Stratum 5) and coastal strata such as 6C (Figure 12.4). The species exhibited strong seasonality, with no records in winter 2022–2023, therefore abundance estimates were not produced for winter due to absence of sightings. Abundance was predicted across much of the continental shelf, with lowest predicted abundances in the eastern areas and the Irish Sea. Model-based density estimates suggested a decline between years, with 0.033 sunfish per km² in Summer 2021 and 0.0023 sunfish per km² in Summer 2022. Using a design-based approach, sunfish abundance was estimated at 7,512 individuals (95% CI: 6,200–9,102) in Summer 2021, and 9,111 individuals (95% CI: 7,064–11,751) in Summer 2022.

During Phase I of the ObSERVE aerial survey programme, ocean sunfish were recorded in both summer and winter seasons across 2015 and 2016 (Rogan *et al*., 2018). The species was widely distributed during summer, with sightings occurring in coastal, neritic, and oceanic waters, indicating broad habitat use in warmer months. A notable difference was observed between the two winter survey periods: while some sunfish were recorded during the first winter (2015–2016; 68 sightings), considerably fewer individuals were detected in the second winter (2016–2017; 26 sightings), with no sunfish recorded in Stratum 5 (Irish Sea) during the winter survey periods and no sightings in coastal strata (Strata 6–8). Model-based density estimates for summer indicated a decline between years, with 0.068 individuals per km^2 in Summer 2015 and 0.023 individuals per km^2 in Summer 2016. Although sunfish were occasionally sighted in winter, abundance and density estimates were not calculated for the winter period due to the low number of observations. Figure 12.5 presents the spatial distribution of ocean sunfish sightings recorded during Phase I of the ObSERVE aerial surveys.

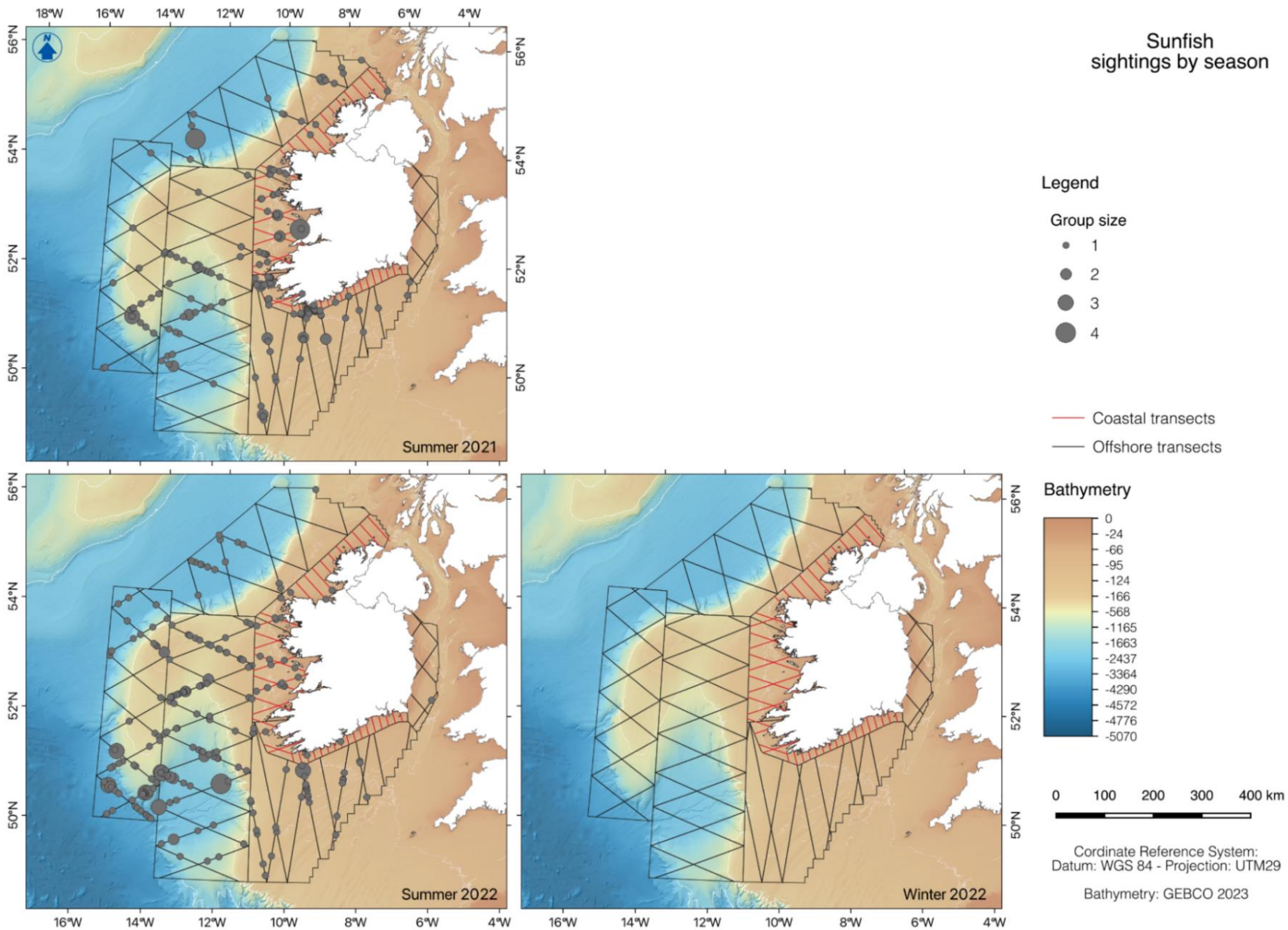

Figure 12.4: Ocean sunfish (*Mola mola*) sightings during Phase II of the ObSERVE Aerial Surveys – during each survey period. Grey lines indicate the survey track lines in the offshore strata and red lines indicate the track lines in the coastal strata. Circles are proportional to the number of sunfish in each sighting (Giralt Paradell *et al.*, 2024)

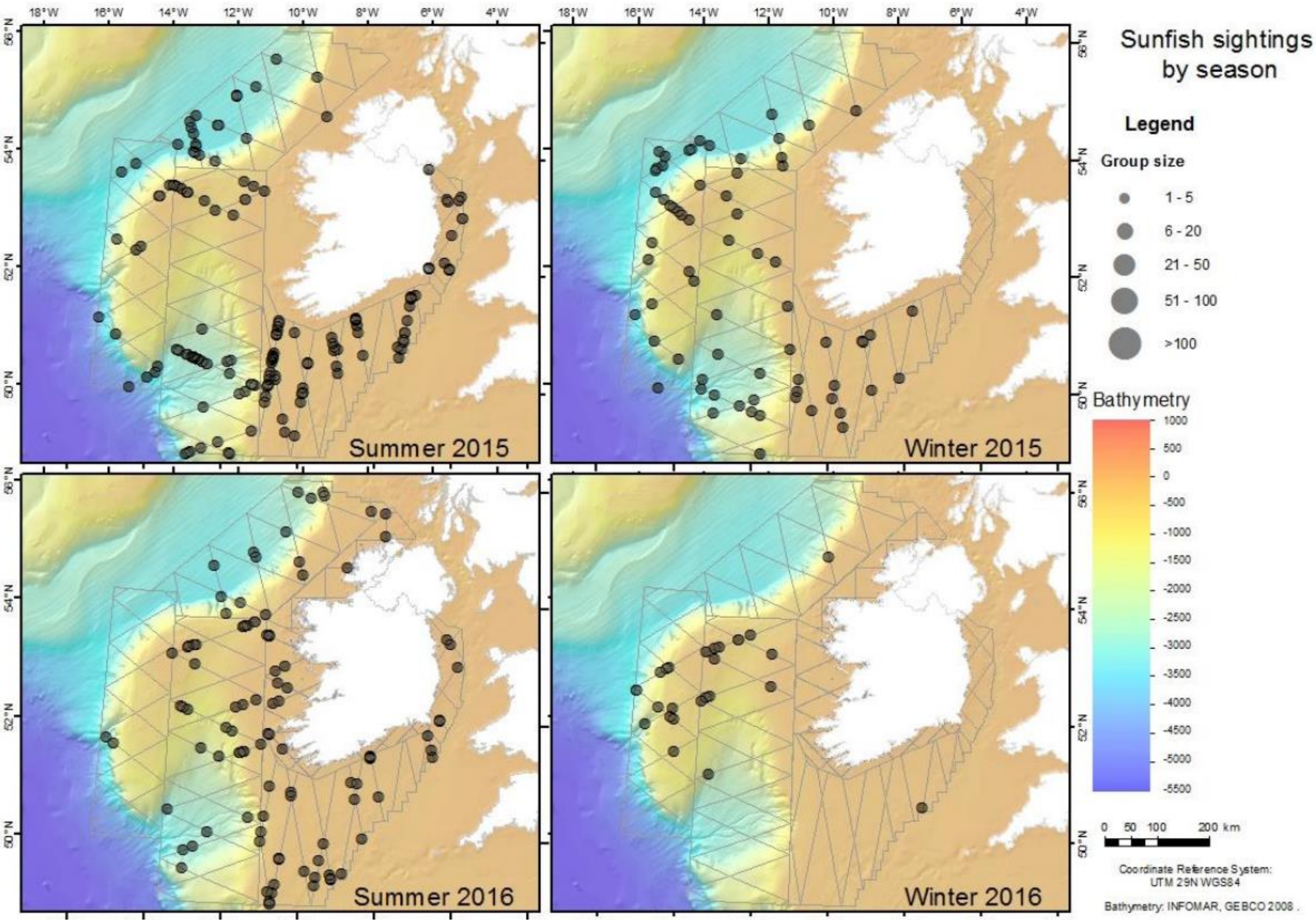

Figure 12.5: Ocean Sunfish (*Mola mola*) sightings during the Phase I of the ObSERVE Aerial Surveys – during each survey period. Grey lines indicate the survey tracklines along which sightings were made. Circles are proportional to the number of individuals in each sighting (Rogan *et al.*, 2018)

12.4.3.2 DEMERSAL AND PELAGIC TELEOSTS

The Fish, Shellfish and Turtle Study Area supports a variety of marine teleost (bony) fish species that may occur seasonally or year-round in coastal and shallow subtidal waters. These include both demersal species, associated with seabed habitats, and pelagic species, which utilise the water column. While no site-specific fish surveys were undertaken for this assessment, the distribution and presence of fish species have been informed by:

- Results of benthic drop-down video and grab sampling surveys (EIAR Technical Appendix 11: Benthic Ecology)
- Regional fisheries literature and datasets (e.g., OSPAR, NPWS, IFI)
- The Arklow Bank Wind Park 2 EIAR (SSE Renewables)
- Phase I and II of the ObSERVE Aerial Survey programme

Demersal species recorded or expected to occur within or near the Proposed Development area include:

- Common goby (*Pomatoschistus microps*) – a small-bodied coastal species tolerant of soft sediments and estuarine conditions.
- Sand goby (*Pomatoschistus minutus*) – common in sandy and mixed sediments.
- Dragonet (*Callionymus lyra*) – typically found over sandy seabeds in shallow subtidal areas.
- Hooknose (*Agonus cataphractus*) – benthic, gravel-associated species.
- Two-spotted goby (*Gobiusculus flavescens*) – observed within reef mosaic areas with macroalgal cover.

Pelagic or semi-pelagic species include:

- Atlantic mackerel (*Scomber scombrus*) – likely to pass through the area during seasonal feeding migrations.
- Sand smelt (*Atherina presbyter*) – often found in shallow, coastal waters.
- Sprat (*Sprattus sprattus*) – small pelagic fish known to form large schools in coastal waters.
- Herring (*Clupea harengus*) – potentially using the area as a migratory corridor or feeding ground, particularly juveniles.

The benthic drop-down video survey identified a low faunal biomass and species diversity, consistent with the modified nature of the port environment and its substrate. However, some small demersal fish were observed in areas of sand veneer and cobble reef, including gobies and dragonet species (refer to EIAR Technical Appendix 11: Benthic Ecology). These areas also support crustacean prey such as common spider crab (*Maja brachydactyla*), indicating potential foraging habitat for benthic and demersal fishes.

Although no evidence of spawning aggregations or key nursery grounds was found within the Proposed Development Boundary, the presence of suitable substrate and prey suggests the site may serve as secondary foraging habitat for juvenile demersal species. The heavily modified harbour environment, regular dredging activity, and elevated turbidity likely limit the diversity and abundance of more sensitive taxa.

Pelagic species, especially shoaling forage fish (e.g., sprat, herring), may occur intermittently, although the enclosed nature of Rosslare Harbour and consistent vessel activity reduce the suitability of the site for persistent pelagic aggregations.

12.4.4 DIADROMOUS FISH

The western Irish Sea supports a range of diadromous fish species that migrate between marine and freshwater environments during different stages of their life cycle. These include several species of high ecological and conservation value, many of which are protected under European and national legislation. Diadromous fish species that have the potential to occur in the Fish, Shellfish and Turtle Ecology Study Area are Atlantic salmon (*Salmo salar*), sea trout (*Salmo trutta* morph. trutta), river lamprey (*Lampetra fluviatilis*), sea lamprey (*Petromyzon marinus*), European eel (*Anguilla anguilla*), and Twaite shad (*Alosa fallax*). The nearest river designated as salmonid waters under the Salmonid River Regulations is the Slaney River, entering the Irish Sea via Wexford Harbour, approximately 6 km north of the Proposed Development. The River Slaney is designated for catch and release angling only from 17th March to 31st August and is closed to fishing at other times (IFI, 2024).

The River Slaney and River Boyne are particularly important catchments in the regional context, both designated as Special Areas of Conservation (SACs) and supporting Annex II species such as Atlantic salmon, lampreys, and European eel. The Slaney River Valley SAC (Site Code: 0781) specifically lists sea lamprey, river lamprey, twaite shad and Atlantic salmon as Qualifying Interests (QIs) of the SAC (NPWS, 2024). Although the River Avoca has experienced historical pollution from mining activities, it continues to support sea trout and may offer limited habitat for other diadromous species.

12.4.4.1 SALMONIDS

Atlantic salmon and sea trout are both anadromous species (a subset of diadromous), meaning they spawn in freshwater before migrating to sea for feeding and growth. Atlantic salmon typically return to rivers from the North Atlantic in spring or summer after one or more winters at sea, with spawning occurring between November and March in well-oxygenated, gravel-bottomed rivers. Juvenile salmon (parr) usually remain in freshwater for two to three years before undergoing smoltification and migrating to sea between March and June (IFI, 2025). Sea trout, by contrast, tend to remain within estuarine and coastal areas following their seaward migration. They exhibit strong coastal fidelity, often staying within 80 km of their natal rivers, and return to freshwater between June and December to spawn (Celtic Sea Trout Project (CSTP), 2016). Both species are of commercial and recreational importance, and their conservation is a key consideration under national fisheries legislation and EU directives.

During the marine phase of their life cycle, many of these species utilise nearshore waters of the western Irish Sea for feeding, growth, or migration. Tagging data from the Celtic Sea Trout Project indicate that sea trout smolts and post-spawning adults exhibit strong coastal affinity, often remaining within 20–40 km of their natal estuaries during early marine life stages (Celtic Sea Trout Project, 2016). These shallow coastal habitats are therefore functionally important for supporting the early survival, foraging, and dispersal of anadromous species.

Acoustic telemetry studies on Atlantic salmon smolts have provided important insights into their migratory pathways through the Irish Sea. Smolts leaving rivers along the northeast coast of Ireland typically undertake a northerly migration through the North Channel, entering deeper offshore waters to the north of Ireland, rather than moving directly south or west through coastal Irish waters (Barry *et al*., 2020). In contrast, salmon populations from Special Areas of Conservation (SACs) in Wales are considered to migrate northward along prevailing current systems in the eastern Irish Sea, again avoiding the western Irish Sea corridor (Cefas, 2024). Additionally, Atlantic salmon originating from rivers in southeast Ireland and from northwest Spain have been tracked migrating westward across the Celtic Sea towards oceanographic fronts and the continental shelf edge, before continuing their transatlantic migration to feeding grounds off East Greenland (Rikardsen *et al*., 2021; refer to Figure 12.6 below). These findings suggest that while Irish coastal waters may be used during the early marine phase, particularly for smolt dispersal and staging, the core migratory routes of Atlantic salmon populations from the east coast of Ireland and other parts of Europe largely bypass the western Irish Sea.

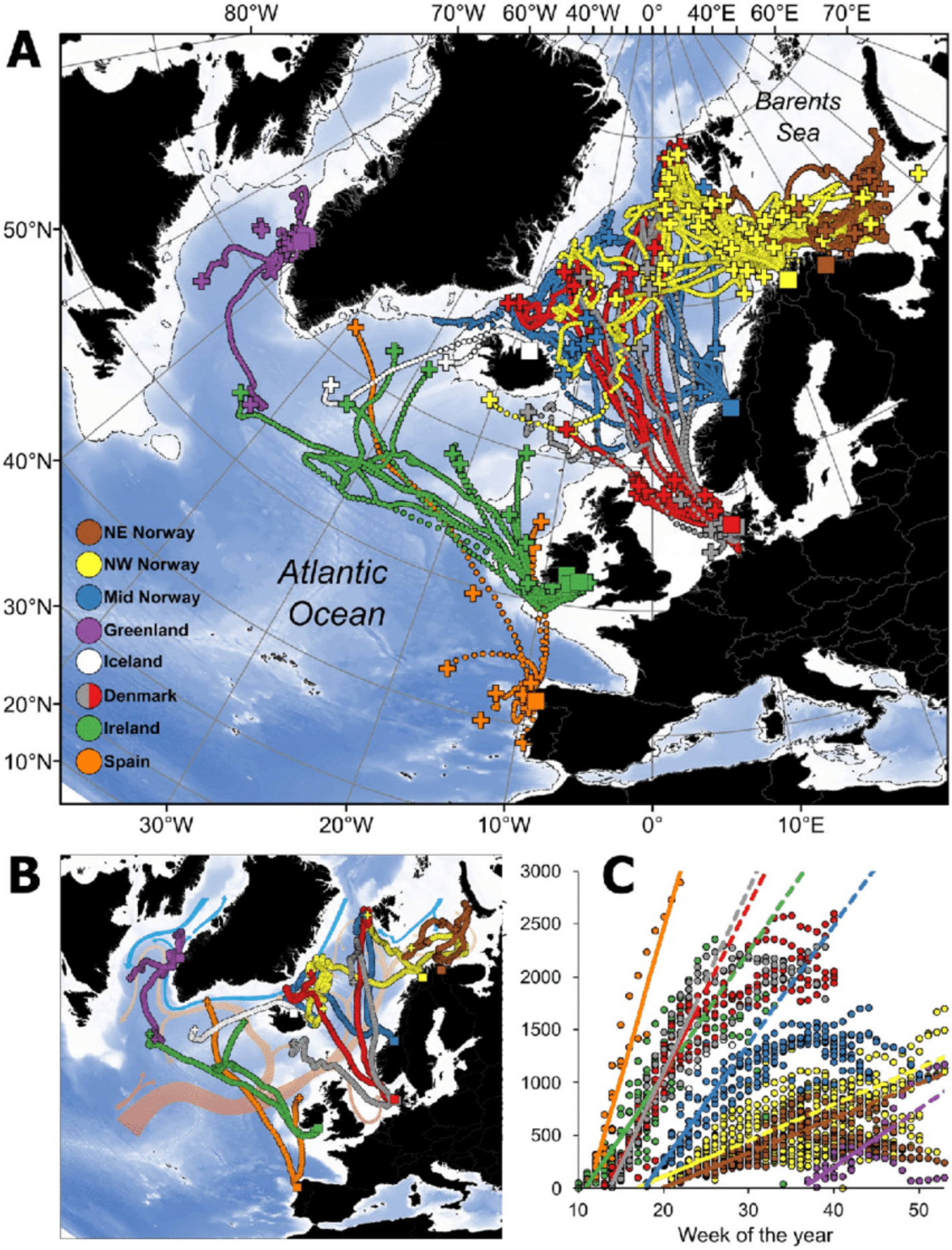

Figure 12.6: Migrations of Atlantic salmon tagged in eight different geographic areas (Rikardsen et al., 2021)

12.4.4.2 CLUPEIDS

Twaite shad is an anadromous member of the herring family that was historically more widespread in Irish rivers but is now considered nationally rare. It is listed under Annex II of the Habitats Directive. Adult Twaite shad migrate into large rivers in spring (April to June) to spawn in fast-flowing, oxygen-rich freshwater habitats, while juveniles migrate downstream to estuarine and coastal waters later in summer. Current Irish populations are primarily confined to the River Barrow and River Suir; however, historical records indicate that the species also occurred in the River Slaney and River Boyne, suggesting potential use of eastern coastal waters during the marine phase (King *et al*., 2011; Inland Fisheries Ireland, 2022).

Twaite shad have only been confirmed in Barrow, with anecdotal reports pointing to a decline of population in the Slaney River Valley SAC of which twaite shad is a qualifying interest (QI). The twaite shad has been categorised under the EU Habitats Directive as an Annex II and V species and Vulnerable on the Ireland Red List (King *et al*., 2011).

12.4.4.3 JAWLESS FISHES – PETROMYZONTIDS

Other important diadromous species include river and sea lamprey. River lamprey undertake short-range anadromous migrations, spawning in autumn and winter in clean, gravelly riverbeds, with larvae (ammocoetes) spending several years in sediment before migrating to sea in spring. Sea lamprey undertake longer marine phases, returning to freshwater rivers in late spring (April to June) to spawn. During their marine phase, both river and sea lamprey are parasitic, attaching to and feeding on the blood and body fluids of other fish species, especially salmonids (Atlantic salmon, sea trout), clupeids (e.g., Twaite shad), and marine species such as herring and cod (Maitland, 2003). While this relationship is naturally occurring and typically does not result in host mortality, it represents an ecologically significant interaction within the western Irish Sea food web (Maitland, 2003). Both species are listed under Annex II of the Habitats Directive, and populations in the River Slaney and River Boyne are of particular conservation concern (NPWS, 2024; Inland Fisheries Ireland, 2022).

12.4.4.4 ANGUILLIDS – EELS

The European eel (*Anguilla anguilla*) is a catadromous species that follows the opposite pattern: adults migrate from Irish rivers to the Sargasso Sea to spawn, and their offspring (glass eels) return to coastal and freshwater environments between February and May. The species is listed as Critically Endangered on the IUCN Red List and is subject to management under the EU Eel Regulation (Council Regulation (EC) No. 1100/2007). Eels utilise estuaries and rivers along the east coast of Ireland for growth and maturation before undertaking their transatlantic spawning migration in autumn (Inland Fisheries Ireland, 2022).

European eels in Irish river systems exhibit a downstream autumn escapement during their silver eel phase, typically between September and December, to begin their transoceanic spawning migration to the Sargasso Sea. Tagging data from Irish catchments, including the River Shannon, River Bann, and Burrishoole system, confirm that eels predominantly exit via the Celtic Sea, adopting a southwesterly migration trajectory toward the Azores and western North Atlantic (Righton *et al*., 2016). While some catchments draining into the Irish Sea may contribute migrating eels to this broader route, the Irish Sea does not appear to serve as a primary migratory corridor based on available telemetry data. Notably, none of the Irish-tagged eels were observed to migrate through the Irish Sea via the North Channel, suggesting a preference for direct access to oceanic waters via the Celtic Sea. However, it is important to acknowledge that no specific release sites were located within the Irish Sea itself (i.e., between eastern Ireland and western Britain). As such, while the available data do not support the Irish Sea as a significant migratory corridor, the absence of Irish Sea release locations limits definitive conclusions regarding eel migration behaviour through this region (Righton *et al*., 2016).

12.4.5 SHELLFISH

Shellfish species within the ZoI include both benthic infaunal and epifaunal species associated with subtidal sedimentary habitats, and mobile macroinvertebrate species of ecological importance, including several species of molluscs and crustaceans. Baseline information is drawn from site-specific benthic surveys and desk-based review of Marine Institute datasets, shellfish atlases, and other relevant sources.

12.4.5.1 FRESHWATER PEARL MUSSEL (*MARGARITIFERA MARGARITIFERA*)

The freshwater pearl mussel (FWPM) is a freshwater bivalve species. It has an obligate ecological dependence on anadromous fish species, particularly Atlantic salmon and brown trout, which are essential host species during the mussel's larval stage. The larval glochidia must attach to the gills of a suitable host fish to complete development. As such, any potential impacts from the Proposed Development on these host salmonid species - such as migratory disruption, population decline, or habitat degradation - may have indirect but ecologically significant consequences for FWPM populations in upstream freshwater systems, including the Slaney River Valley SAC. Similarly, the life cycles of other migratory fish species such as twaite shad may also intersect with FWPM habitats. While no FWPM populations occur within the marine or intertidal zones of the Proposed Development, their inclusion in this chapter is justified by the species' reliance on anadromous fish hosts that may be affected by the Proposed Development, creating a potential indirect pathway for impact on upstream populations within designated sites such as the Slaney River Valley SAC.

12.4.5.2 MARINE SHELLFISH SPECIES

As described in Chapter 11: Benthic Ecology, site-specific benthic grab sampling and dropdown video surveys recorded a range of shellfish taxa across both soft sediment and cobble reef habitats. Infaunal assemblages in circalittoral muddy sands and mixed sediments were dominated by disturbance-tolerant species such as *Abra alba*, *Nucula nitidosa*, *Corbula gibba*, and *Tellina fabula*. These shellfish taxa reflect a community structure typical of frequently disturbed or organically enriched coastal sediments.

The common spider crab (*Maja brachydactyla*) was observed in significant aggregations within cobble reef areas and occasionally on adjacent sediments on seabed imagery collected. This species is ecologically important as both a predator and prey item in nearshore food webs.

Although no dense commercial shellfish beds were observed, the biotope mapping and video footage confirmed the presence of structurally complex habitats that may offer localised ecological functions (e.g., shelter, foraging substrate) for mobile fish and invertebrates.

No evidence of sensitive shellfish features such as *Zostera* beds, maerl, or native oyster (*Ostrea edulis*) beds was found. Invasive alien species (IAS) were not detected, though dedicated IAS surveys were not conducted. The shellfish community in the vicinity of the Proposed Development is therefore characterised by opportunistic infauna and patchily distributed epifauna, with limited sensitivity and low conservation concern.

In addition to the benthic assemblages recorded during site-specific surveys, several mobile shellfish species of ecological importance were identified within the Study Area by the desk-based review of fisheries and shellfish resource data and through local knowledge shared through the Fisheries Consultative Group. These species contribute to local benthic-pelagic coupling, food web dynamics, and structural habitat functions.

- Razor clam (*Ensis siliqua*): A burrowing bivalve inhabiting mud and muddy sand sediments typically between 4–14 m depth. Razor clams reproduce via pelagic larval dispersal and exhibit slow growth rates, with adult shell lengths reaching up to 220 mm.
- Surf clam (*Spisula solida*): Found in clean, coarse sandy substrates, surf clams form discrete aggregations and contribute to sediment stabilisation. Spawning occurs in early summer, followed by a pelagic larval phase.
- Whelk (*Buccinum undatum*): An epibenthic gastropod inhabiting sandy and mixed sediments up to 50 m depth. Whelk reproduce via benthic egg masses with direct development, indicating likely population structuring at a local scale.
- Lobster (*Homarus gammarus*): Associated with rocky reef and complex seabed habitats, lobster populations have limited migratory movements. Larval dispersal is pelagic and occurs in early summer.
- Velvet crab (*Necora puber*): A fast-growing crustacean inhabiting shallow mixed sediments and reef areas, contributing to predator-prey interactions in nearshore ecosystems.
- Brown crab (*Cancer pagurus*): A large, long-lived crustacean found on mixed sediments and reefs, with a planktonic larval dispersal phase lasting 30–50 days post-spawning.
- Spider crab (*Maja brachydactyla*): Common on mixed sediment and reef habitats, spider crab migrate seasonally inshore to release larvae during spring and early summer.
- Shrimp (*Palaemon serratus*): A demersal species associated with inshore mixed sediments and reefs. Shrimp are short-lived, with recruitment variability linked to environmental conditions.
- Scallop (*Pecten maximus*): A sedentary epifaunal bivalve inhabiting coarse sands and gravels. Adults are capable of limited swimming via shell clapping when disturbed. Reproduction involves pelagic larval dispersal.

Consideration of the potential effects of the Proposed Development on the ecological functions of these species is provided in Section 12.4.9. Commercial fisheries pressures and socio-economic implications are addressed separately in Chapter 15: Commercial Fisheries and Aquaculture.

Species Summary of Marine Shellfish

A summary of the baseline information on key marine shellfish species recorded or considered likely to occur within the Study Area is provided in Table 12.6, with typical habitat preferences, life history traits, likely presence based on desk study and field surveys, and the ecological roles of each species outlined to highlight ecological characteristics relevant to the species' vulnerability to habitat disturbance, sedimentation, and other pressures associated with the Proposed Development.

Table 12.6: Marine shellfish species summary

Species	Habitat Type	Key Life History Traits	Likely presence in ZoI	Ecological Role
Razor clam (*Ensis siliqua*)	Muddy sand sediments (4–14 m depth)	Slow growing; pelagic larval dispersal	Likely (based on habitat suitability and local knowledge)	Infaunal filter feeder; benthic community stabiliser
Surf clam (*Spisula solida*)	Clean coarse sand and gravels	Pelagic larvae; localised stocks	Likely (based on local knowledge)	Filter feeder; sediment stabiliser
Whelk (*Buccinum undatum*)	Sand and mixed sediments (to 50 m)	Direct developer; long-lived	Confirmed (based on desk study and field habitat and local knowledge)	Benthic scavenger and predator
Lobster (*Homarus gammarus*)	Rocky reef and mixed substrates	Limited movement; pelagic larvae	Likely (based on reefs nearby and local knowledge)	Predator and scavenger; reef ecosystem component
Velvet crab (*Necora puber*)	Shallow mixed reef-sediment habitats	Fast growing; multiple broods/year	Confirmed (catch records and habitat and local knowledge)	Benthic predator and prey species
Brown crab (*Cancer pagurus*)	Sediment and reef habitats	Long-lived; pelagic larval phase	Likely (south coast stocks nearby and based on local knowledge)	Benthic scavenger and predator

Species	Habitat Type	Key Life History Traits	Likely presence in ZoI	Ecological Role
Spider crab (*Maja brachydactyla*)	Mixed sediments and reefs	Terminal moult; seasonal migration	Confirmed (aggregations observed)	Seasonal predator; prey for large fishes
Shrimp (*Palaemon serratus*)	Mixed sedimentary and reef habitats	Short-lived; annual recruitment	Likely (based on habitat and local knowledge)	Important prey species for fishes
Scallop (*Pecten maximus*)	Sandy, gravelly, mixed sediments	Limited movement; pelagic larvae	Potential (deep sand/gravel offshore)	Sediment stabiliser; prey species

12.4.6 NURSERY AND SPAWNING GROUNDS

Early life stages of many fish and shellfish species are ecologically sensitive to habitat disturbance, sedimentation, and water quality changes. Understanding the distribution of spawning and nursery grounds within the ZoI is therefore critical to assessing potential impacts on the sustainability of local populations.

Spatial datasets compiled by the Marine Institute's Marine Atlas (https://atlas.marine.ie) and the International Council for the Exploration of the Sea (ICES) indicate that the Proposed Development Boundary overlaps with spawning and/or nursery areas for several ecologically important marine species (EIAR Technical Appendix 12). Although Nephrops (*Nephrops norvegicus*) is taxonomically a shellfish species, it is included here for consistency with the structure of the Marine Institute and ICES datasets, which present Nephrops spawning and nursery grounds alongside those of fish species.

The following overlaps with recognised spawning and nursery grounds are noted:

- Nephrops (*Nephrops norvegicus*): The Proposed Development Boundary overlaps with recognised spawning and nursery grounds for Nephrops.
- Lemon sole (*Microstomus kitt*): Spawning and nursery grounds overlap with the Proposed Development Boundary.
- Sprat (*Sprattus sprattus*): Spawning grounds overlap with the Proposed Development Boundary; sprat is a key foraging species within the Irish Sea ecosystem.
- Cod (*Gadus morhua*) and Whiting (*Merlangius merlangus*): Nursery grounds for cod and both spawning and nursery grounds for whiting overlap with the Proposed Development Boundary. These demersal species are important components of the Irish Sea ecosystem.
- Horse mackerel (*Trachurus trachurus*) and Mackerel (*Scomber scombrus*): Nursery grounds for both species overlap with the Proposed Development Boundary.

- Herring (*Clupea harengus*): The Proposed Development Boundary overlaps with recognised nursery areas for herring and lies close to, but does not directly overlap, herring spawning grounds.

Although spawning and nursery grounds are present within or adjacent to the Proposed Development Boundary, it is important to note that Rosslare Europort is an active harbour environment already subject to significant anthropogenic disturbance. Nonetheless, these areas may provide important habitat for early life stages of both demersal and pelagic species. These baseline considerations inform the impact assessments presented in Section 12.4.9.

Detailed information on spawning and nursery ground distributions is provided in EIAR Technical Appendix 12.

12.4.7 ELASMOBRANCHS

Elasmobranchs, comprising sharks, skates, and rays, are cartilaginous fishes characterised by slow growth, late maturity, and low fecundity, making them inherently vulnerable to anthropogenic pressures. Several species of conservation concern occur in Irish waters, including benthic and pelagic forms. While many elasmobranchs are wide-ranging and mobile, some species exhibit strong site fidelity to specific nursery or foraging habitats, particularly in shallow coastal waters, estuaries, and sandy or muddy benthic habitats. As such, understanding their spatial and temporal distribution within the Proposed Development footprint and wider study area is essential for assessing potential impacts.

This section describes the relevant elasmobranch species recorded or potentially present in the vicinity of the Proposed Development, their ecological characteristics and conservation status, and evaluates potential impacts associated with the Proposed Development.

Note: No nursery grounds for elasmobranchs were identified within the immediate footprint of the Proposed Development, and no species were recorded during site-specific benthic or vantage point surveys. However, potential presence is inferred based on wider regional datasets and known species distributions within Irish coastal and shelf waters.

12.4.7.1 SHARKS

Sharks represent the pelagic and demersal components of the elasmobranch assemblage in Irish waters, with species diversity spanning both oceanic and coastal zones. Many sharks are highly mobile, undertaking long-distance seasonal migrations across the Northeast Atlantic, while others exhibit more localised movements associated with foraging or reproductive behaviours. In Irish waters, shark presence is typically seasonal, with increased surface activity observed during the warmer months. Although no shark species were recorded within the immediate footprint of the Proposed Development, several species, including blue shark (*Prionace glauca*) and basking shark (*Cetorhinus maximus*), are known to occur regionally and are periodically observed further offshore. This section provides an overview of the key shark species of relevance to the Proposed Development, summarising their ecology, conservation status, and distribution, with particular reference to aerial survey data and regional records.

Site-specific benthic habitat mapping within the Proposed Development footprint, characterised by mixed sediments and sandy substrates, suggests that suitable habitat is available for benthic and demersal shark species. Given their broad habitat preferences and regional distribution, the occurrence of lesser spotted dogfish, starry smooth-hound, spurdog and tope within or near the Propoed Development site is considered likely.

Blue Shark (Prionace glauca)

The blue shark is a highly migratory pelagic elasmobranch found throughout temperate and tropical oceans, including the northeast Atlantic. It is considered one of the most wide-ranging shark species globally, exhibiting extensive seasonal migrations influenced by water temperature, ocean currents, and prey availability (Campana *et al*., 2011; Queiroz *et al*., 2016). Blue sharks feed primarily on pelagic fish and squid, and are typically found in deep offshore waters, although they also utilise continental shelf regions during summer months. In Irish waters, blue sharks are seasonally present, with most records occurring during summer and early autumn when sea surface temperatures are elevated.

Blue sharks are solitary or loosely aggregating and are usually observed as single individuals during aerial surveys. They exhibit a high degree of mobility, with telemetry studies showing long-distance movements exceeding thousands of kilometres, often associated with trans-oceanic migration routes and seasonal foraging areas (Queiroz *et al*., 2012; Vandeperre *et al*., 2014). Ireland lies within the broader northeast Atlantic migratory corridor used by blue sharks travelling between subtropical latitudes and temperate feeding grounds.

Despite being one of the most frequently caught shark species in global pelagic fisheries, blue sharks are currently listed as "Near Threatened" on the IUCN Red List, with concerns over declining populations due to high bycatch rates and limited management in international waters (Rigby et al., 2019). In Irish waters, they are not subject to domestic conservation designations but are included in elasmobranch monitoring efforts under national biodiversity and fisheries research programmes.

The blue shark (*Prionace glauca*) was the most frequently observed shark species recorded during Phase II of the ObSERVE aerial survey programme, with 149 sightings comprising 155 individuals (Giralt Paradell *et al*., 2024). Sightings were concentrated in continental shelf waters, particularly within strata 3 and 4, with fewer observations in strata 1, 2, 6B, and 6C. No blue sharks were recorded in the Irish Sea. Only two sightings (1%) occurred in winter, indicating a strong seasonal pattern in surface presence. Model-based abundance estimates indicated notable interannual variability, with 3,053 individuals (95% CI: 1,218–4,351) estimated in Summer 2021, and a reduced estimate of 1,033 individuals (95% CI: 291–2,114) in Summer 2022. As with other shark species, no abundance estimates were generated for Winter 2022–2023 due to the limited number of sightings. Figure 12.7 presents the predicted summer distribution of blue sharks across Irish waters as modelled in Phase II.

In addition to confirmed sightings of blue and basking sharks, 50 sightings of unidentified shark species were recorded during Phase II of the ObSERVE aerial survey programme (Giralt Paradell *et al*., 2024). These sightings were largely concentrated in continental shelf waters, particularly within Strata 3 and 4, with occasional detections in deeper offshore waters, including the Rockall Trough and Porcupine Seabight. All unidentified shark sightings occurred during summer surveys, consistent with the strong seasonality observed across all shark species. Figure 12.8 shows the spatial distribution of unidentified shark sightings, highlighting their occurrence in both shelf and deep-water habitats during the summer survey periods.

During Phase I of the ObSERVE aerial survey programme, blue sharks were recorded almost exclusively during the summer months of both survey years (Rogan *et al*., 2018). Sightings were concentrated in waters to the south and west of Ireland, with a small number of additional sightings in more coastal waters observed during the second summer survey. No blue sharks were recorded in the Irish Sea. Abundance estimates using a design-based modelling approach were similar between years, with 2,037 individuals estimated in summer 2015 (CV: 27.37%) and 2,596 individuals in summer 2016 (CV: 25.45%). Note, estimates were not corrected for availability bias and are therefore likely to be conservative. Figure 12.9 illustrates the distribution of blue shark sightings recorded during Phase I of the ObSERVE aerial surveys.

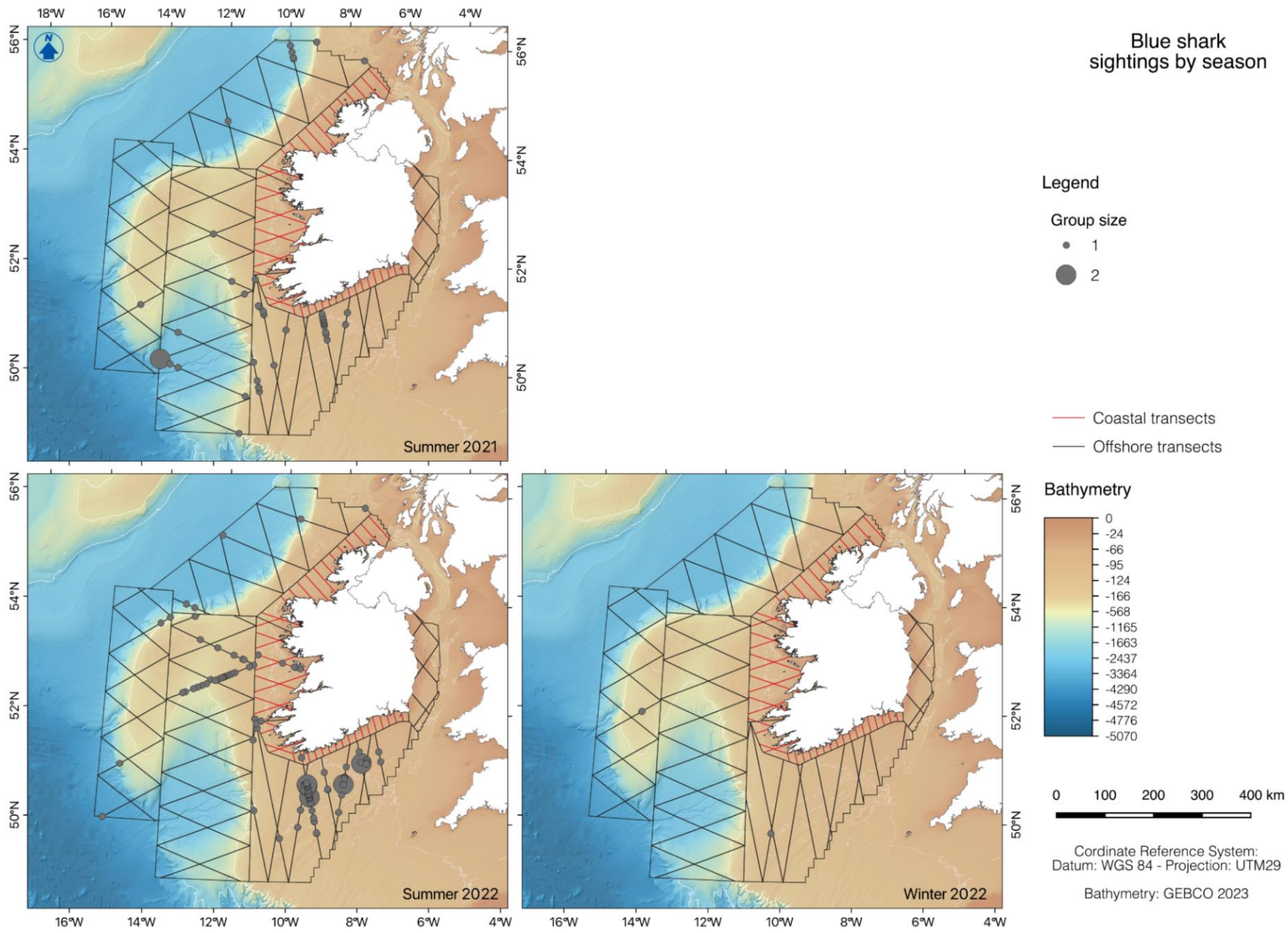

Figure 12.7: Blue shark sightings during Phase II of the ObSERVE Aerial Surveys – during each survey period. Grey lines indicate the survey track lines in the offshore strata and red lines indicate the track lines in the coastal strata. Circles are proportional to the number of individuals in each sighting (Giralt Paradell *et al.*, 2024)

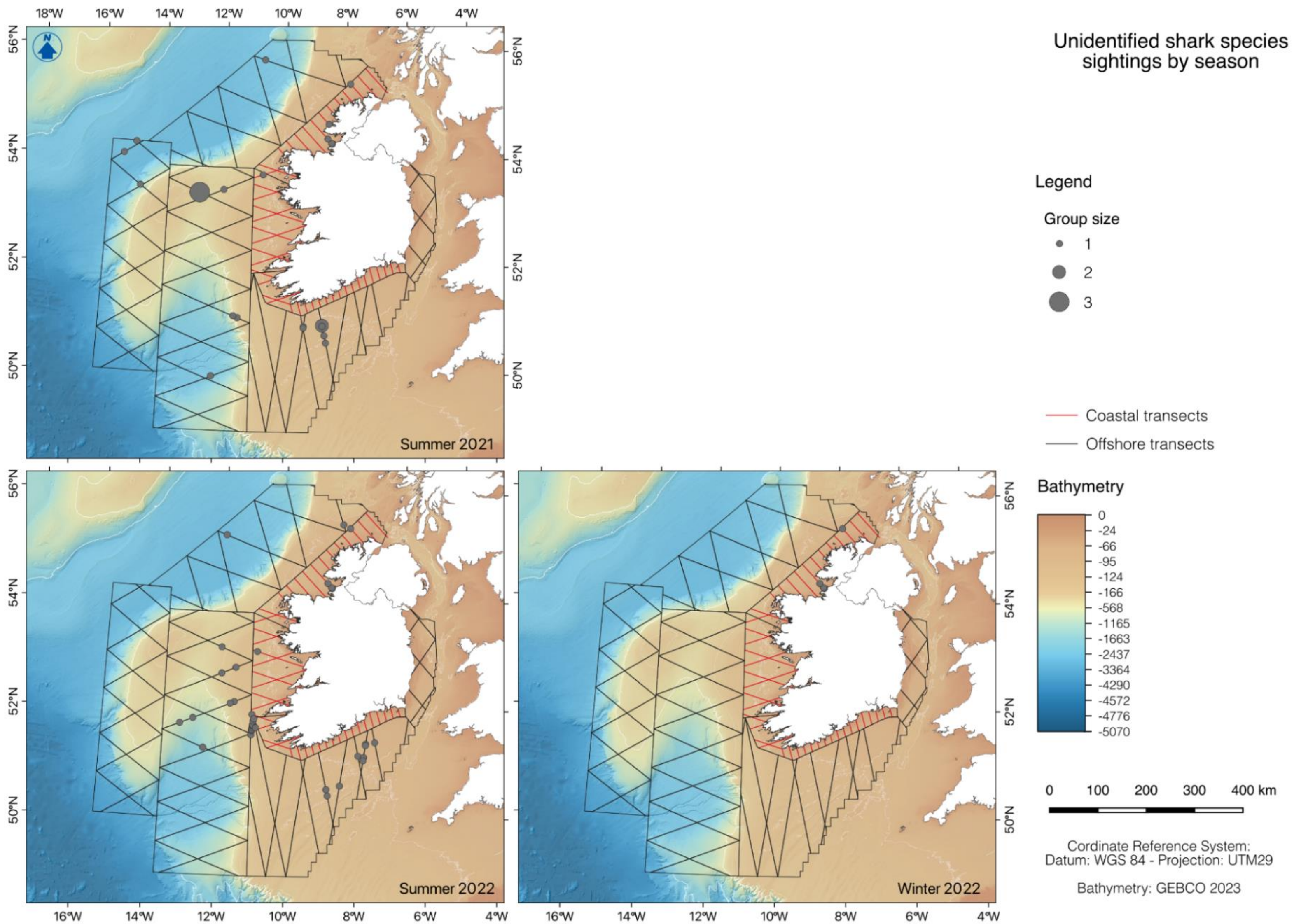

Figure 12.8: Unidentified shark sightings during Phase II of the ObSERVE Aerial Surveys – during each survey period. Grey lines indicate the survey track lines in the offshore strata and red lines indicate the track lines in the coastal strata. Circles are proportional to the number of individuals in each sighting (Giralt Paradell *et al.*, 2024)

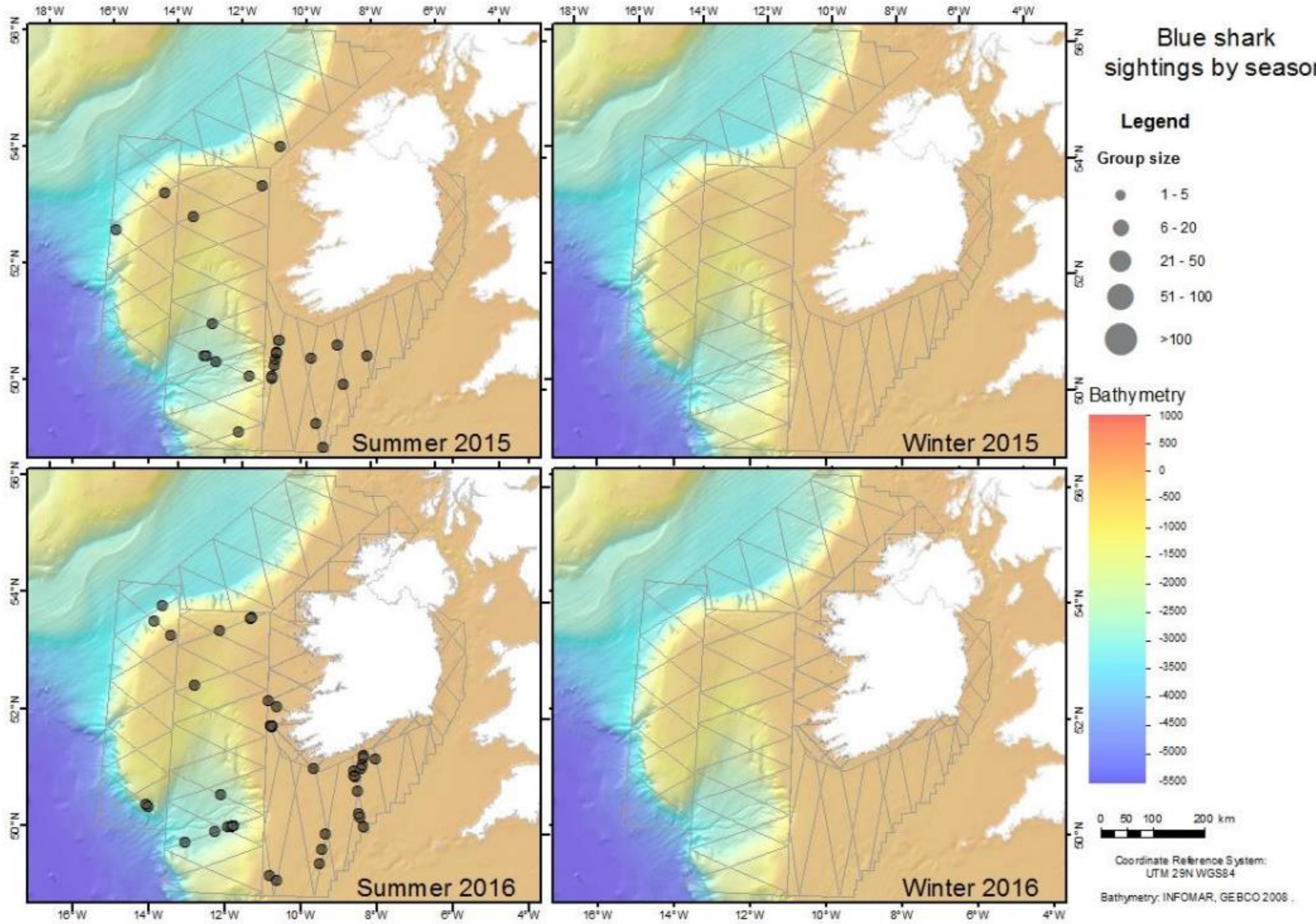

Figure 12.9: Blue shark sightings during the Phase I of the ObSERVE Aerial Surveys – during each survey period. Grey lines indicate the survey tracklines along which sightings were made. Circles are proportional to the number of individuals in each sighting (Rogan et al., 2018)

Basking Shark (Cetorhinus maximus)

Basking sharks are obligate filter feeders, relying on zooplankton as their primary food source. As such, their seasonal distribution is closely linked to the availability of suitable foraging areas, particularly those rich in planktonic prey (Sims, 2008; Sims *et al*., 2006). Sightings are most common during summer months, particularly in recognised aggregation areas or 'hotspots' such as western Ireland, western Scotland, southwest England, and the Isle of Man (Witt *et al*., 2012). Although not a core aggregation area, the Irish Sea is regularly used by basking sharks during summer and forms part of their wider seasonal range (Berrow and Heardman, 1994; Southall *et al*., 2005; Doherty *et al*., 2017; Witt *et al*., 2012).

Tagging and telemetry studies have demonstrated that basking sharks exhibit both localised site fidelity and long-distance movements, with individuals capable of travelling rapidly between regions in search of plankton-rich feeding grounds (Sims *et al*., 2003). More recently, genetic tagging studies have indicated that the Irish Sea may act as a migratory corridor connecting multiple foraging sites across the northeast Atlantic (Lieber *et al*., 2020).

During summer, basking sharks are commonly observed swimming near the surface, either singly or in small groups, feeding at slow speeds when plankton concentrations are high. In contrast, winter behaviour is characterised by deeper diving (>750 m) and more extensive movement patterns, sometimes involving migrations of over 3,000 km to locate alternative foraging areas (Sims *et al*., 2003).

Despite increased scientific attention, many aspects of basking shark life history remain poorly understood, particularly in relation to reproduction. Courtship-like behaviours have been observed in Irish coastal waters, particularly off the west coast, during late summer, and recent video tagging studies using animal-borne cameras have provided new insights into potential social interactions occurring at depth (Rudd *et al*., 2021).

In contrast, winter months are associated with more extensive migrations and deep diving behaviour (>750 m), as sharks move further offshore to locate alternative prey sources (Sims *et al*., 2003). Despite increased research attention, many aspects of basking shark life history remain poorly understood, particularly in relation to mating and breeding sites. While courtship-like behaviours have been observed off western Ireland and Scotland between May and November, these events are not spatially consistent, suggesting the possibility of environmental drivers influencing site selection (Sims *et al.,* 2022).

Although their movements can span thousands of kilometres, basking sharks also exhibit localised site fidelity and may use the Irish Sea as a migratory corridor (Lieber et al., 2020). In Ireland, basking sharks are now afforded full legal protection under Section 23 of the Wildlife Act 1976, as amended, which prohibits their deliberate capture, disturbance, or interference with breeding or resting areas.

A data request to the IWDG confirmed only one basking shark sighting in the general vicinity of the Proposed Development within the past decade: an adult basking shark recorded near Tuskar Rock on 08/08/2017.

During Phase II of the ObSERVE aerial survey programme, a total of 25 sightings comprising 41 individuals were made over the course of the surveys, with basking sharks recorded almost exclusively in continental shelf waters shallower than 200 m (Giralt Paradell *et al*., 2024). Sightings showed strong seasonality, with 96% of sightings recorded during the summer survey periods, and only two observations made in deeper offshore waters, including one during Winter 2022–2023. The majority of sightings occurred in coastal stratum 6B accounting for the majority of sightings. Additional sightings occurred in Strata 1, 2, 3, 4, and 6A. No basking sharks were recorded in the Irish Sea. Figure 12.10 presents the observed distribution of basking sharks during the Phase II of ObSERVE summer (2021 and 2022) aerial surveys, highlighting the species' preference for coastal shelf waters, particularly along the south-western margin of the Irish European Economic Zone (EEZ).

Basking sharks were recorded during both summer seasons of Phase I of the ObSERVE aerial survey programme, with an additional single sighting in winter 2016–2017 (Rogan *et al*., 2018). In contrast to blue sharks, most basking sharks were observed in coastal strata, reflecting a stronger association with inshore waters, although one sighting was made in the Irish Sea. The abundance estimates suggested higher abundance in the second survey year, which likely reflects increased survey effort in inshore strata in 2016. The model estimated 2,019 individuals in summer 2016 (CV: 39.85%) and a density of 0.006 basking sharks per km^2, though as with blue sharks, estimates were not corrected for availability bias and are therefore likely to be conservative. Figure 12.11 shows the distribution of basking shark sightings recorded during Phase I, highlighting the species' coastal preference and limited presence in offshore areas.

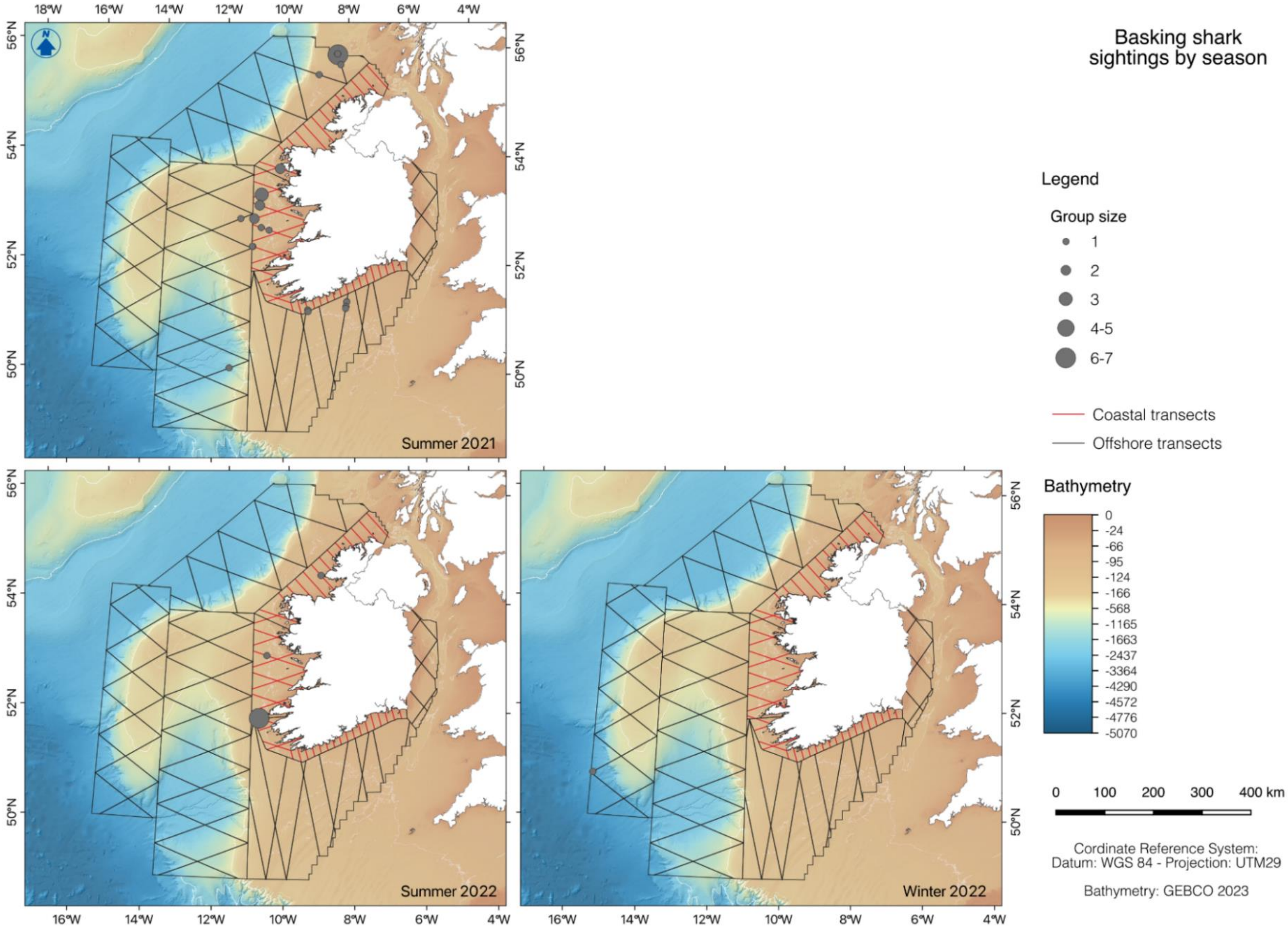

Figure 12.10: Basking shark sightings during Phase II of the ObSERVE Aerial Surveys – during each survey period. Grey lines indicate the survey track lines in the offshore strata and red lines indicate the track lines in the coastal strata. Circles are proportional to the number of individuals in each sighting (Giralt Paradell *et al.*, 2024)

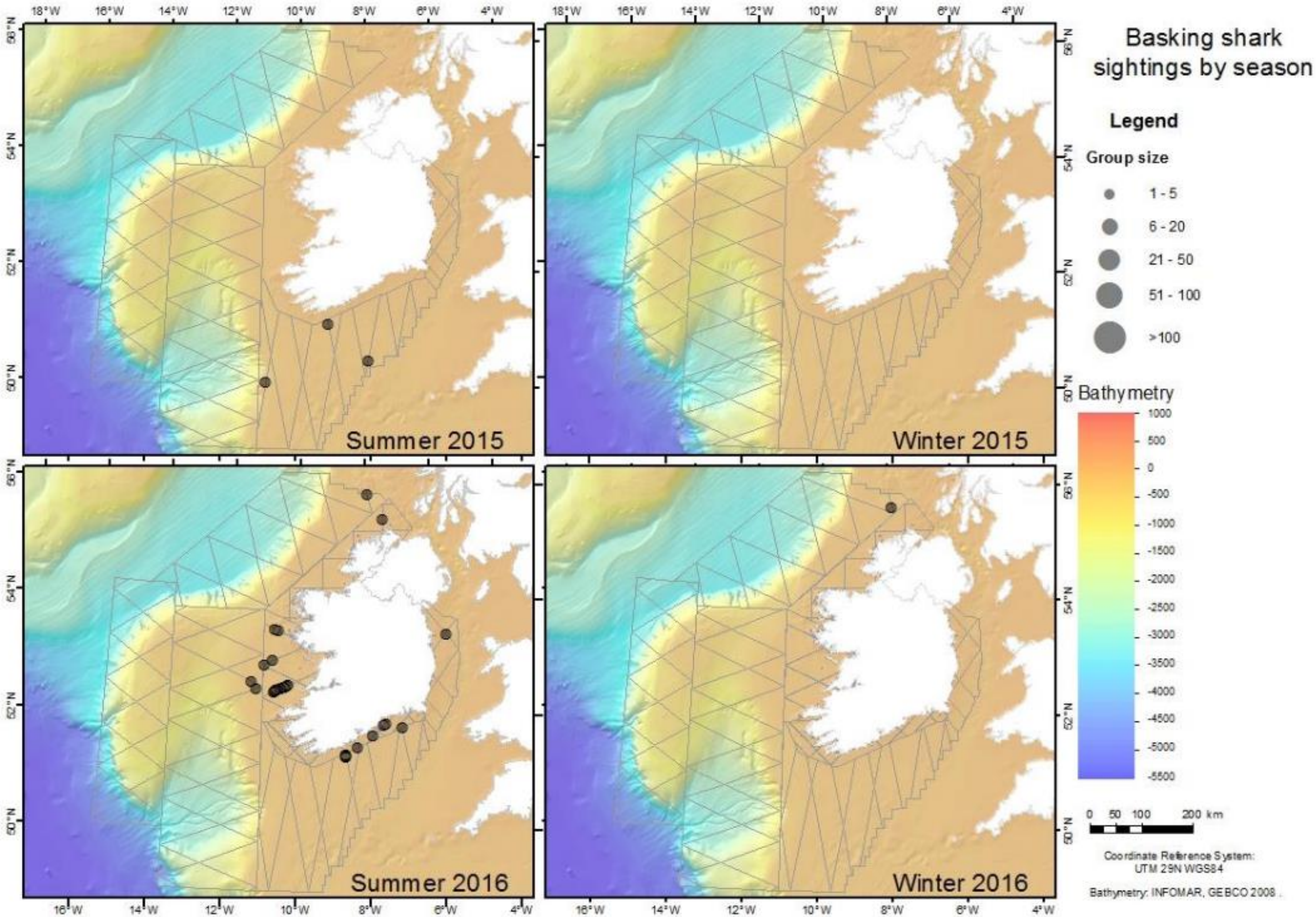

Figure 12.11: Basking shark sightings during the Phase I of the ObSERVE Aerial Surveys – during each survey period. Grey lines indicate the survey tracklines along which sightings were made. Circles are proportional to the number of individuals in each sighting (Rogan *et al*., 2018)

Other Shark Species

Several shark species are known to occur in the wider western Irish Sea region, including the lesser spotted dogfish (*Scyliorhinus canicula*), starry smooth-hound (*Mustelus asterias*), spurdog (*Squalus acanthias*), and tope (*Galeorhinus galeus*) (Lynam and Ribeiro, 2022; Ellis et al., 2005). These species have been identified through desk-based review of published literature and fisheries-independent surveys relevant to the Irish Sea. While site-specific elasmobranch surveys have not been undertaken for the Proposed Development, the presence of these species in the region informs the ecological baseline and impact assessment for the wider marine fish assemblage.

Lesser Spotted Dogfish (Scyliorhinus canicula)

This small demersal shark is among the most common species in coastal and shelf waters of the Northeast Atlantic, including the Irish Sea. It occupies a wide range of substrates — from sand and gravel to mixed and muddy sediments — and is typically associated with shallow to mid-shelf depths. Its diet consists mainly of benthic invertebrates such as crustaceans, molluscs, and annelid worms, as well as small fish (Ellis et al., 1996). Given its abundance, generalist habitat preferences, and relatively fast life-history traits, it is categorised as *Least Concern* on Ireland's Red List of cartilaginous fishes (Clarke et al., 2016). The dominant sandy and mixed sediment habitats present within the Proposed Development footprint are considered suitable for this species, suggesting local occurrence is likely, particularly for foraging.

Starry Smooth-hound (Mustelus asterias)

A benthic coastal shark, the starry smooth-hound favours sandy and gravelly substrates and is commonly recorded in the Irish and Celtic Seas. It primarily feeds on decapod crustaceans, especially crabs, and exhibits seasonal patterns in distribution associated with temperature and prey availability. While less intensively studied than other species, fisheries data indicate it can be locally abundant in suitable habitats. It is not currently regarded as threatened; however, as with other coastal elasmobranchs, it may be susceptible to localised habitat disturbance or bycatch. Its presence within the receiving environment of the Proposed Development is considered possible, especially in summer when inshore habitat use typically increases.

Spurdog (Squalus acanthias)

Spurdog is a slow-growing, long-lived shark species that occurs widely in Irish coastal and deeper shelf waters. It forms seasonal aggregations and is associated with a range of substrate types, particularly mixed or muddy seabeds. Its diet includes fish, cephalopods, and benthic invertebrates (Ellis *et al*., 2005). Due to its low reproductive output and historical overfishing, it is listed as *Endangered* on the Irish Red List (Clarke *et al*., 2016). Although no direct records exist for the Proposed Development site, the species may occur occasionally in deeper or less disturbed areas of the wider study area, especially where suitable habitat is present.

Tope (Galeorhinus galeus)

Tope is a wide-ranging, benthopelagic shark species found in temperate regions worldwide. In the Northeast Atlantic, including Irish waters, it exhibits seasonal movements and occupies a broad range of habitats, from shallow coastal areas to deeper continental shelf zones. In the Irish Sea, tope are regularly recorded at depths between approximately 17 and 200 m, where they forage on a range of demersal and pelagic prey including fish and cephalopods (Ellis *et al*., 1996; Ellis *et al*., 2005).

This species is slow-growing and late-maturing, with females producing relatively few young after a long gestation period, traits that confer low resilience to population declines. Tope are therefore considered vulnerable to anthropogenic pressures such as overfishing and habitat degradation. Although now subject to protective measures in EU waters, the species is listed as *Vulnerable* on the Irish Red List of cartilaginous fishes (Clarke *et al*., 2016), reflecting historic population reductions and ongoing concerns over bycatch in mixed demersal fisheries.

12.4.7.2 SKATES AND RAYS

Skates represent an important component of the benthic fish assemblage in the Irish Sea. Species such as thornback ray (*Raja clavata*) and spotted ray (*Raja montagui*) are widely distributed across coastal and offshore areas (Ellis *et al*., 2005;).

Skates and rays are demersal elasmobranchs typically associated with sandy or muddy seabeds in coastal and shelf waters. Unlike their pelagic shark counterparts, these species are generally more sedentary, often exhibiting strong site fidelity to nursery and foraging habitats, some of which may overlap with the ZoI of nearshore developments. In Irish waters, several skate and ray species are of conservation concern due to population declines linked to fishing pressure, habitat degradation, and inherently low reproductive rates. Their life history traits - including late maturity, large egg cases (in oviparous species), and limited dispersal - increase their sensitivity to anthropogenic disturbance. Although no individuals were recorded during site-specific marine surveys, the potential for occurrence of skate and ray species within the vicinity of the Proposed Development is acknowledged.

12.4.8 MARINE TURTLES

Marine turtles are infrequent visitors to Irish waters, with the leatherback turtle (*Dermochelys coriacea*) being the most commonly recorded species. These turtles are known to migrate to temperate regions, including the Celtic and Irish Seas, primarily during the summer months (July to September), coinciding with the abundance of their gelatinous prey, such as jellyfish.

In Irish and UK waters, five marine turtle species have been documented:

- Leatherback turtle (Dermochelys coriacea)
- Loggerhead turtle (Caretta caretta)
- Kemp's ridley turtle (Lepidochelys kempii)
- Green turtle (Chelonia mydas)
- Hawksbill turtle (Eretmochelys imbricata)

Among these, the leatherback is the most frequently observed, while the others are considered rare visitors, often recorded as strandings.

The east coast of Ireland, including the vicinity of the Proposed Development near Rosslare, is not recognised as a significant area for marine turtle activity. Notably, the ObSERVE aerial surveys, conducted to assess the occurrence and distribution of marine megafauna in Irish waters, did not report any sightings of marine turtles in the Irish Sea region during their extensive survey periods.

12.4.8.1 LEATHERBACK TURTLE (*DERMOCHELYS CORIACEA*)

During Phase II of the ObSERVE aerial survey programme, two sightings of leatherback turtle were recorded in Summer 2021, both located off the west coast of Ireland. One individual was observed in deep waters beyond the continental slope, while the other was recorded within continental shelf waters (Giralt Paradell *et al*., 2024). These sightings reflect the occasional seasonal presence of leatherback turtles in Irish waters, likely associated with foraging behaviour during summer months. Due to the very low number of detections, no abundance or density estimates were generated for this species. Figure 12.12 illustrates the recorded locations of leatherback turtle sightings during ObSERVE Phase II.

As part of Phase I of the ObSERVE aerial survey programme, Rogan *et al*. (2018) recorded a small number of turtle sightings over two years of aerial monitoring across the Irish EEZ. All positively identified sightings of leatherback turtle occurred during summer surveys (Figure 12.13), while one additional sighting in summer and one in winter were attributed to an unidentified turtle species (Figure 12.14). Leatherback turtle sightings were confined to the southernmost extent of the survey area, specifically within stratum 4 (Figure 12.13), while there was a summer and winter sighting of an unidentified turtle species observed in deeper offshore waters of strata 1 and 4 (Figure 12.14). Due to the low number of observations, no abundance or density estimates were generated for either species group.

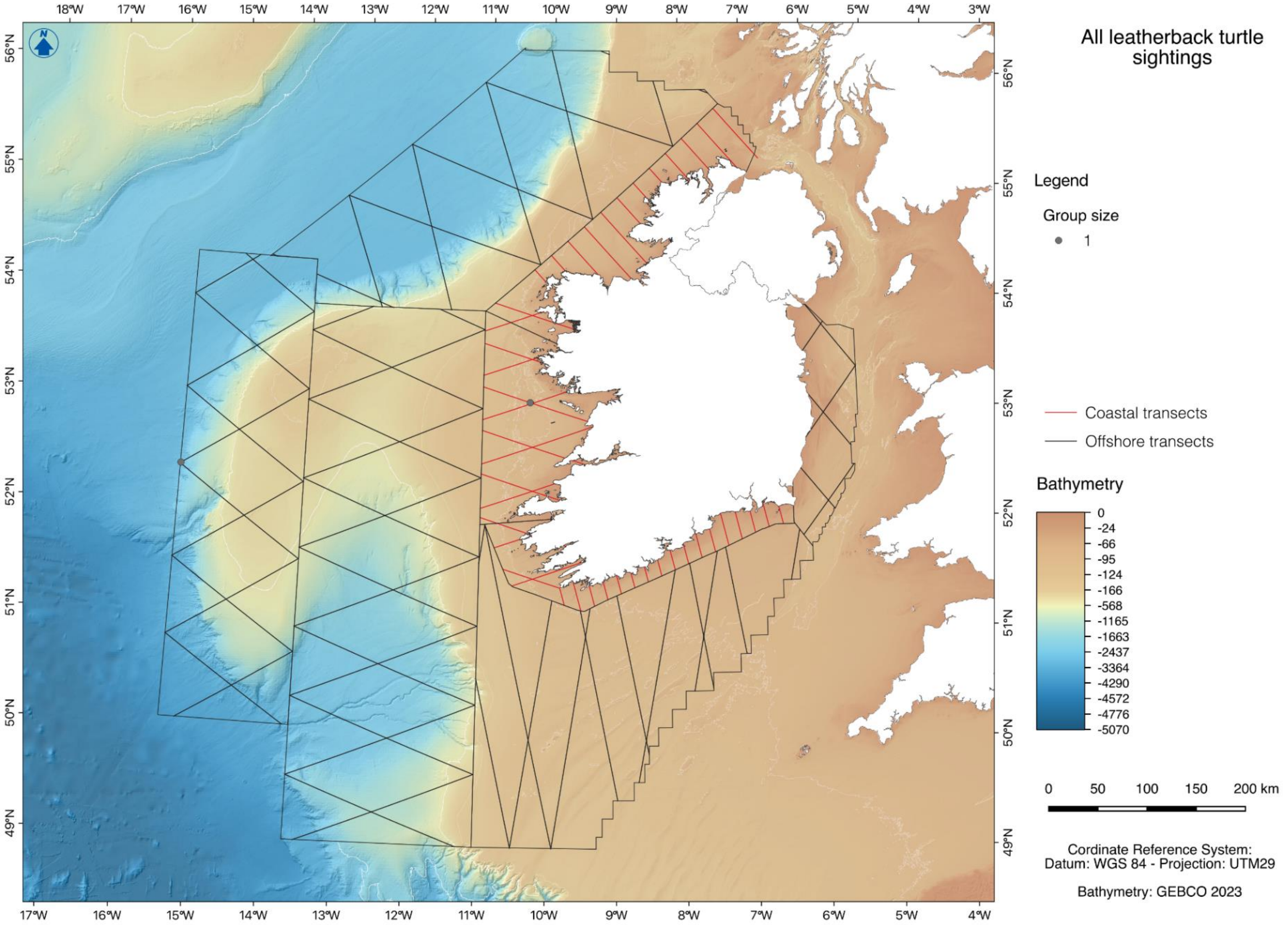

Figure 12.12: Leatherback turtle sightings during Phase II of the ObSERVE Aerial Surveys – all surveys combined. Grey lines indicate the survey track lines in the offshore strata and red lines indicate the track lines in the coastal strata. Circles are proportional to number of leatherback turtles in each sighting (Giralt Paradell *et al.*, 2024)

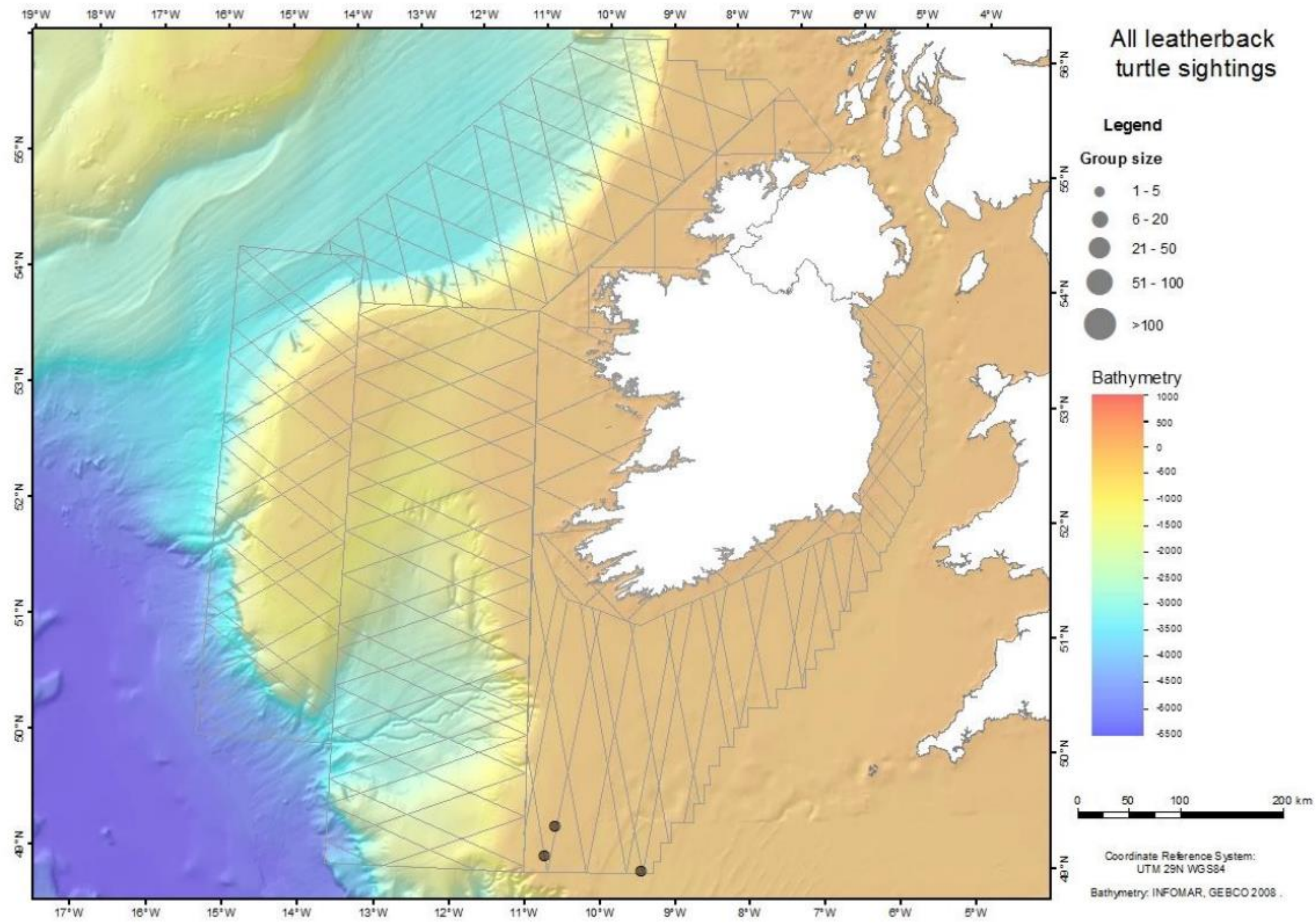

Figure 12.13: Leatherback turtle sightings during the Phase I of the ObSERVE Aerial Surveys at the southern tip of the survey effort in stratum 4 – all surveys combined, however, all sightings occurred in the summer 2015 and summer 2016. Grey lines indicate the survey tracklines along which sightings were made. Circles are proportional to the number of individuals in each sighting (Rogan *et al*., 2018)

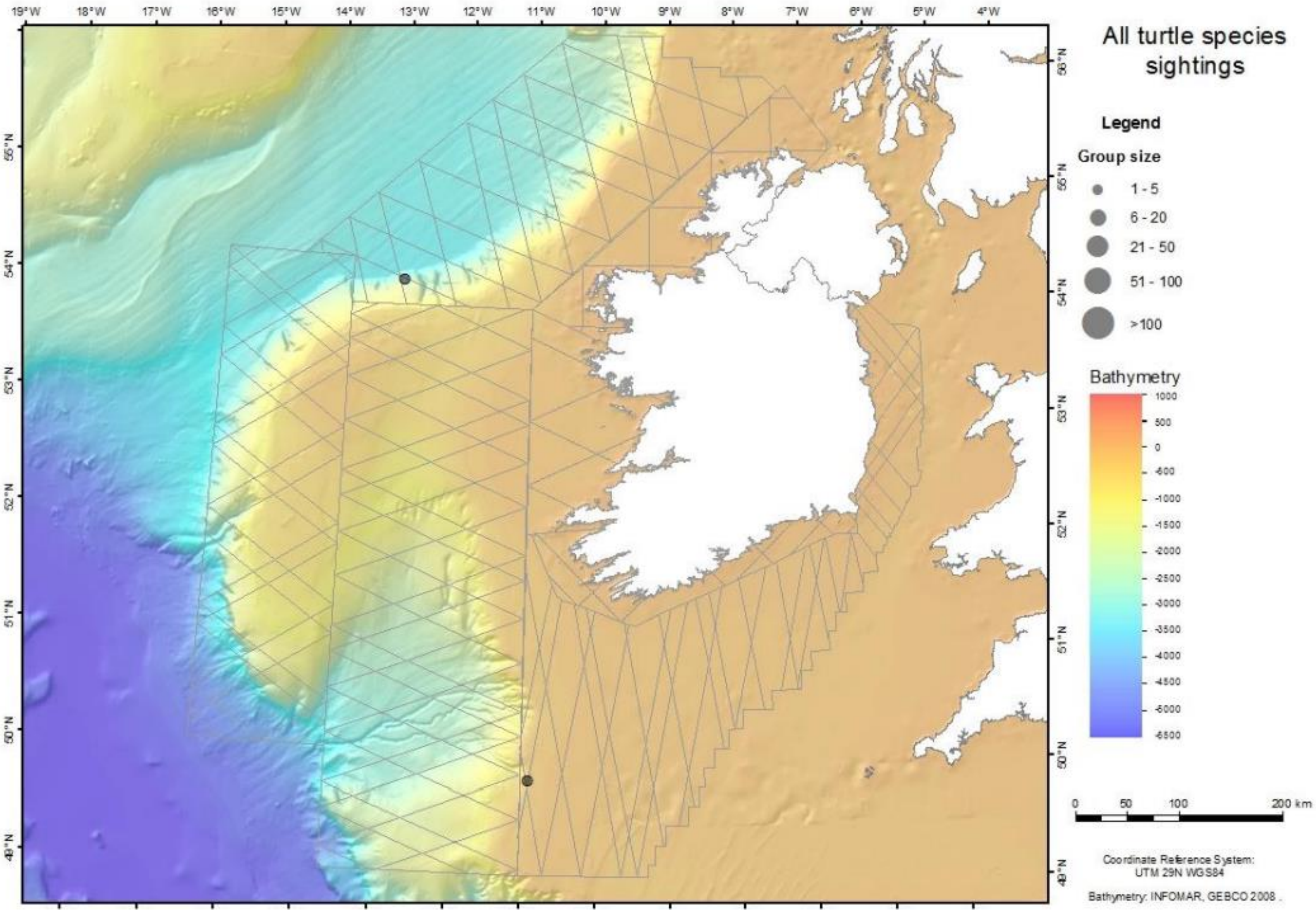

Figure 12.14: Unidentified turtle species sightings during the Phase I of the ObSERVE Aerial Surveys located in deeper water, in strata 1 (summer 2015) and 4 (winter 2015) – all surveys combined. Grey lines indicate the survey tracklines along which sightings were made. Circles are proportional to the number of individuals in each sighting (Rogan *et al*., 2018)

12.4.8.2 LOGGERHEAD TURTLE (*CARETTA CARETTA*)

A single loggerhead turtle was observed during Phase II of the ObSERVE aerial surveys, with one sighting of a solitary individual recorded south of Hook Lighthouse (Co. Waterford) in Summer 2021 (Giralt Paradell *et al*., 2024). This is the only confirmed loggerhead turtle sighting across both survey years. The sighting occurred in continental shelf waters, representing a rare but documented occurrence of the species in Irish coastal waters. As with leatherback turtles, the limited number of sightings precluded any modelling of density or abundance. Figure 12.15 shows the spatial distribution of this single loggerhead turtle observation within the Irish EEZ.

No loggerhead turtles were identified during Phase I of the ObSERVE aerial surveys; however, unidentified turtle species were recorded (refer to Figure 12.14).

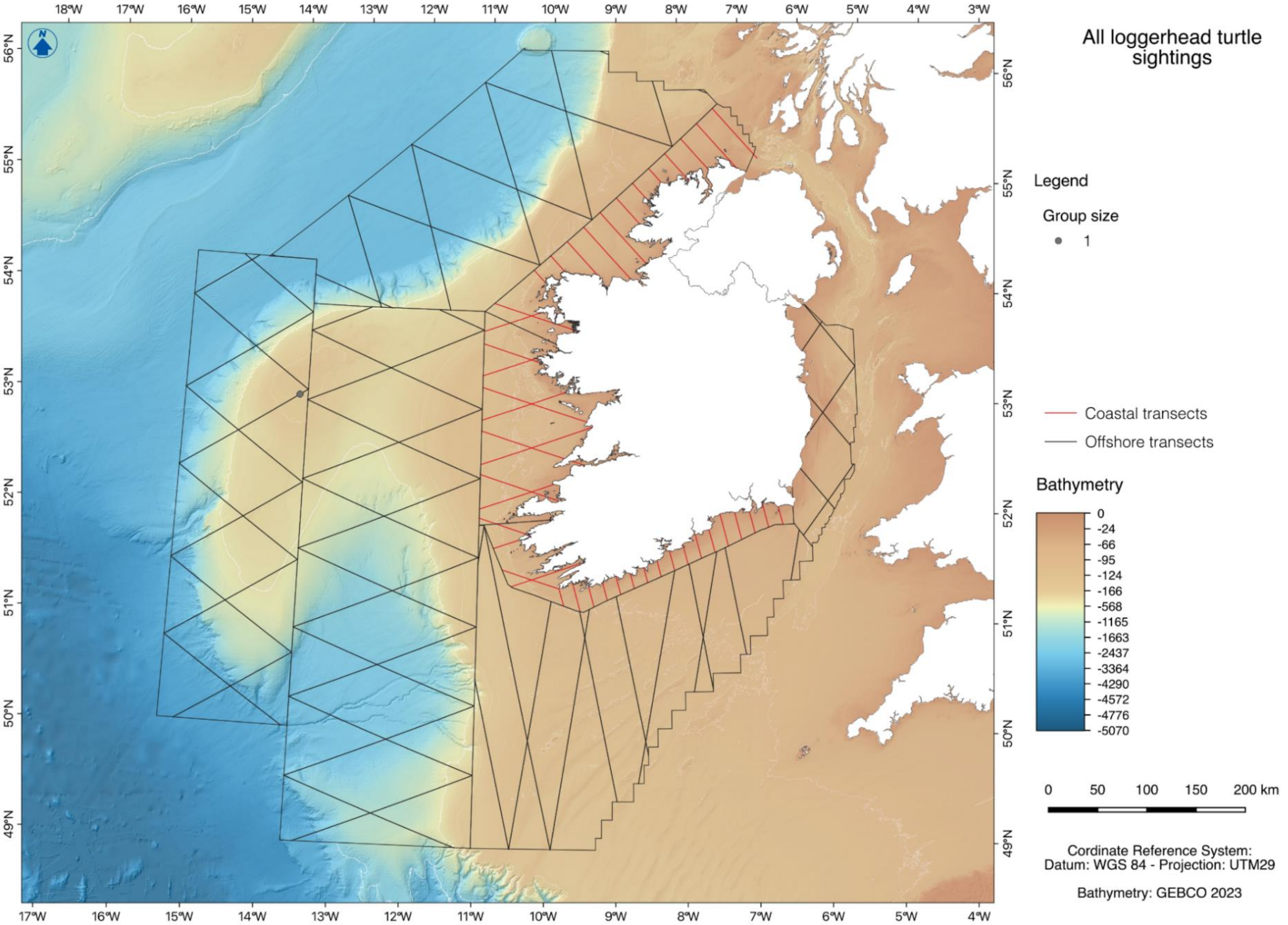

Figure 12.15: Loggerhead turtle sightings during Phase II of the ObSERVE Aerial Surveys. Grey lines indicate the survey track lines in the offshore strata and red lines indicate the track lines in the coastal strata. Circles are proportional to the number of loggerhead turtles (Giralt Paradell *et al.*, 2024)

12.4.9 AMBIENT UNDERWATER NOISE BASELINE

To characterise the existing underwater noise environment at the Proposed Development site, baseline acoustic monitoring was undertaken by the Irish Whale and Dolphin Group (IWDG) using a calibrated SoundTrap ST600 HF Long Term Recorder (Ocean Instruments, 2024). The device was deployed from 26 April to 1 July 2024 for a total of 67 days, recording 804 hours of acoustic data (30 minutes every hour) at a sampling rate of 96 kHz, capturing broadband sound up to 48 kHz. This approach follows recommended practice for ambient underwater noise monitoring under the Marine Strategy Framework Directive (MSFD; Dekeling *et al*., 2015 and Picciulin *et al*., 2016) and subsequent best-practice guidance on measuring acoustic habitats (Merchant *et al*., 2015).

Analysis of the recorded data demonstrated that the ambient underwater noise environment within Rosslare Europort is consistently elevated due to frequent vessel traffic and port operations. Root-mean-square (RMS) broadband sound pressure levels (SPLs) were calculated using both unweighted and auditory-weighted metrics, following Southall et al. (2019) hearing group functions. The unweighted broadband RMS SPL was 143 dB re 1 µPa, with the following weighted values summarised for relevant hearing groups:

Table 12.7: Unweighted and weighted broadband ambient SPL measured at the Proposed Development on a given day

Hearing Group	RMS SPL (dB re 1 µPa)
Unweighted (UW)	143
Low-frequency (LF)	142
High-frequency (HF)	122
Very high-frequency (VHF)	119
Phocid carnivores in water (PCW)	134

While these auditory weightings are primarily applied to marine mammals, the results provide useful context for understanding the prevailing acoustic environment. Many fish species are known to detect low-frequency sounds (<1.5 kHz), and exposure to elevated ambient noise may influence their behaviour through masking, avoidance, or stress. The baseline recordings confirm that fish present in or near the harbour are likely already habituated to anthropogenic noise.

12.5 ASSESSMENT OF IMPACTS

This section evaluates the potential impacts of the Proposed Development on fish, shellfish and turtle receptors during construction and operation.

The potential for impacts on fish, elasmobranchs, and turtle species arising from the construction and operation of the Proposed Development has been identified based on the project design, baseline conditions, and relevant guidance. These potential impacts include both direct and indirect pressures such as underwater noise, habitat loss, sedimentation, and water quality degradation. The key impact pathways considered in this assessment are summarised in Table 12.8 below and are assessed in further detail in Section 12.4.9.

Table 12.8: Summary of Likely Significant Effects on Fish, Elasmobranchs, and Turtles

Project Phase	Likely Significant Effect	Description	Nature of Effect
Construction	Disturbance or Injury due to underwater noise generated from construction activities	Underwater noise generated from dredging, rock blasting (if required), and piling may disturb acoustically sensitive species, such as migratory fish, elasmobranchs (e.g., skates, rays), and large pelagic species such as basking sharks. Sea turtles, including the leatherback, may also be affected by high-intensity sound. Duration, sound levels, and species hearing range determine significance.	Direct
	Temporary habitat disturbance or loss	Dredging and reclamation will disturb or remove subtidal and intertidal habitats used by epibenthic and benthic fish, and demersal elasmobranchs (e.g., rays). Although large mobile species (e.g., sharks, turtles) are unlikely to depend on these habitats directly, indirect prey-base impacts may occur.	Direct
	Permanent (long-term) habitat loss of fish spawning and nursery grounds due to presence of foundations and land reclamation of the seabed	The permanent loss of subtidal and intertidal habitat (e.g., mixed sediment and tidal mud- and sandflats) due to seabed reclamation and the installation of marine infrastructure (e.g., quay walls, foundations) may reduce the availability of spawning or nursery habitat for demersal and epibenthic fish species. While no sensitive or designated spawning grounds have been identified within the Proposed Development area, some species (e.g., plaice, sandeel) may be locally affected. Indirect effects on elasmobranchs and other predators may also arise through reduced prey availability.	Direct/Indirect

Project Phase	Likely Significant Effect	Description	Nature of Effect
	Effects of increases in suspended sediment concentrations (SSC) and potential sedimentation / smothering on fish during construction activities	Elevated suspended sediment concentrations may reduce water quality, impact filter feeders, and smother demersal eggs or benthic prey species. Smothering may indirectly affect foraging sharks and rays.	Direct/Indirect
	Effects of accidental release of pollutants	Spills or leaks of hydrocarbons or chemicals during construction may pose a toxic risk to all fish life stages, elasmobranchs, and sea turtles if encountered during transit or feeding.	Direct
Operation	Habitat modification	Changes to benthic habitat structure and sediment dynamics may influence local fish distribution.	Direct
	Artificial habitat creation and fish aggregation	New hard infrastructure may provide shelter or substrate for benthic and reef-associated fish species, indirectly benefiting predators such as elasmobranchs. Aggregation of species may occur near quay walls or rock armour.	Indirect
	Effects of increases in SSC and potential sedimentation / smothering during operational activities	Operational activities such as vessel movements or propeller wash may result in localised sediment resuspension, potentially affecting water quality and leading to smothering of benthic habitats used by fish or their prey.	Direct/Indirect

Project Phase	Likely Significant Effect	Description	Nature of Effect
	Maintenance-related disturbance	Periodic dredging during maintenance may cause sediment resuspension and temporary degradation of water quality, which could affect the availability of prey and reduce foraging efficiency of demersal and pelagic predators, including rays and sharks.	Direct
	Barrier effects on migratory species	The presence of fixed infrastructure and harbour structures may act as partial barriers or alter movement corridors for migratory species, particularly diadromous fish, depending on timing and location. While long-term displacement is unlikely, localised avoidance may occur during key migratory periods.	Direct
	Disturbance or injury due to underwater noise generated from operations	Underwater noise generated during ongoing operations (e.g., vessel activity, harbour maintenance) may disturb acoustically sensitive species, particularly during foraging or migratory movements. While levels are expected to be lower than construction-phase noise, some behavioural disturbance may occur.	Direct

12.5.1 ESTABLISHING THE ZOI

The Zone of Influence (ZoI) refers to the spatial area within which ecological receptors - namely fish, spawning and nursery grounds, shellfish, sea turtles, and basking sharks - may be subject to significant impacts from the Proposed Development. It encompasses both direct impacts (e.g., habitat loss, increased turbidity, or elevated noise levels) and indirect impacts (e.g., displacement, stress responses, or prey redistribution).

Two ZoIs have been defined for this assessment, based on activity-specific modelling outputs:

12.5.1.1 SEDIMENT DISPERSION ZOI

Based on hydrodynamic and plume dispersion modelling associated with dredging and reclamation works, suspended sediment concentrations exceeding background levels are predicted to extend approximately 1.5 km west and 2.5 km southeast along the shoreline from the Proposed Development Boundary (refer to Chapter 8: Coastal Processes). This ZoI encompasses the area where fish, shellfish and turtle receptors may be exposed to temporarily elevated turbidity, smothering risks, or reduced foraging efficiency due to suspended particles or benthic habitat disturbance. The spatial extent reflects the maximum modelled plume dispersion under spring tide conditions and represents the conservative boundary for potential sediment-related effects.

12.5.1.2 UNDERWATER NOISE ZOI

Acoustic modelling of impact piling (using a 240 kJ hammer) and rock blasting indicates that impulsive sound sources may propagate further than sediment-related effects. For the most sensitive receptors – such as fish eggs and larvae or stationary hearing-specialist fish – exceedance of 186 dB re 1 $\mu Pa^2 s$ SEL (temporary threshold shift (TTS) onset threshold; Popper et al., 2014) was predicted to extend:

- Up to 150 m for piling (static larvae/fish eggs)
- Up to 105 m for blasting (all fish groups; range 30-170 m)
- Up to 10 m for dredging (fish eggs/larvae only)

These distances reflect the outer limits of potential effect based on modelling inputs. Predictions are based on conservative assumptions for stationary receptors and a swim speed of 1.5 m/s for mobile fish.

Accordingly, the underwater noise ZoI has been defined as up to 150 m from piling and 105 m from blasting activities (based on zero-to-peak SPL exceedance for all fish groups), and up to 10 m from dredging activities (based on cSEL exceedance for stationary eggs and larvae). The noise-related ZoI for dredging is nested within the sediment dispersion ZoI and does not extend beyond it.

Together, these activity-specific ZoIs represent the maximum areas within which fish, shellfish, spawning and nursery grounds, turtles, or basking sharks may be affected by the Proposed Development. They have been used to structure the baseline data collation and inform the assessment of likely significant effects. The ZoIs are further refined by receptor group, where spatial thresholds are defined per activity type, based on ecological sensitivity, life history traits, and the best available scientific evidence.

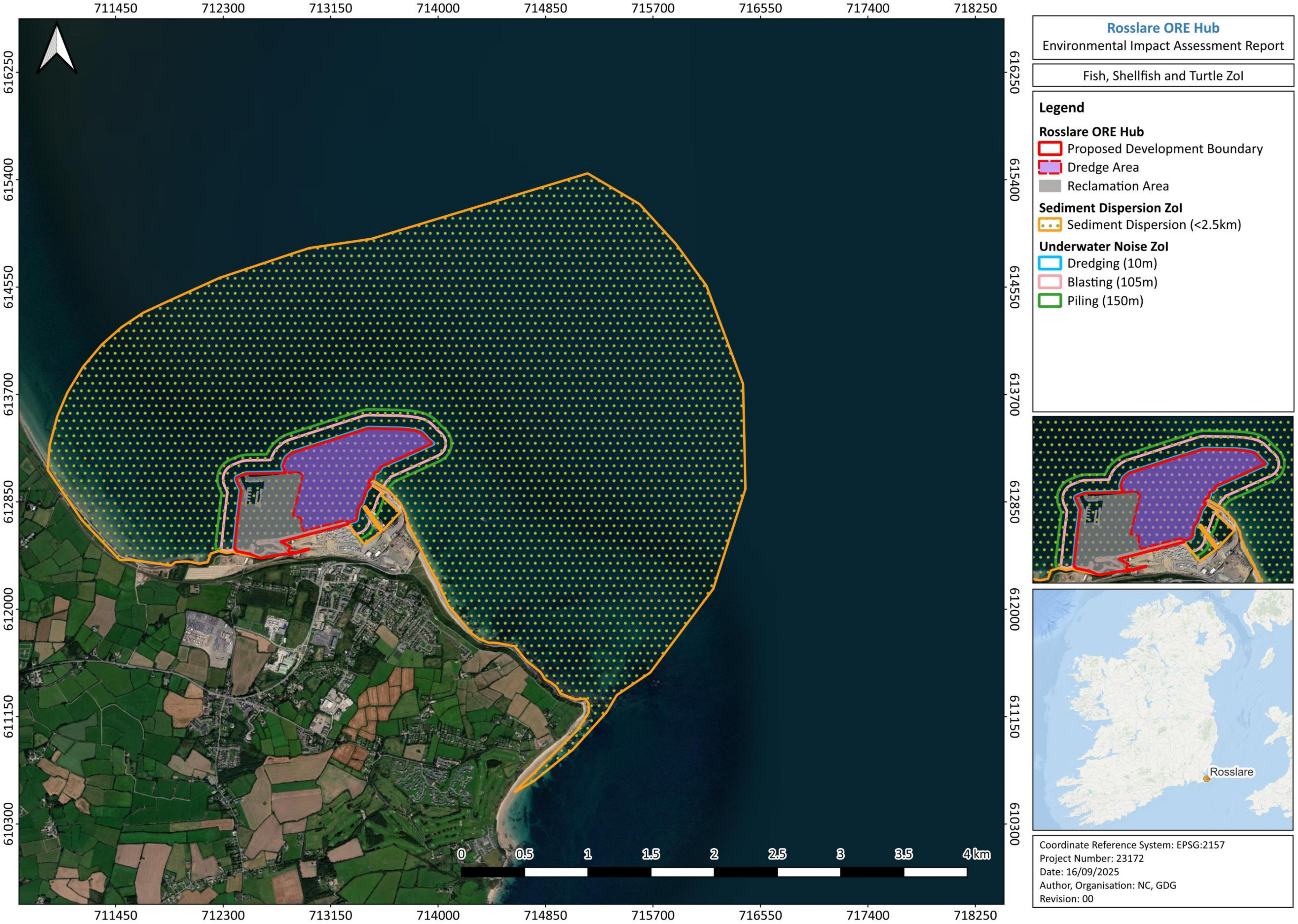

Figure 12.16: Fish, Shellfish and Turtle Zone of Influence

12.5.2 KEY ECOLOGICAL RECEPTORS

Figure 12.16 below provides a summary of the ecological evaluation for fish, shellfish and turtle species with potential to be affected by the Proposed Development. The evaluation has been undertaken in line with guidelines from CIEEM (2024), and considers each receptor's conservation status, ecological importance, and potential exposure via a source-pathway-receptor link.

Only receptors present within the ZoI of the Proposed Development and of sufficient ecological value are considered KERs. Receptors that do not occur within the ZoI, or lack a viable impact pathway, are not carried forward in the impact assessment. Similarly, widespread or common species with low conservation concern may be excluded unless they are likely to experience ecologically significant impacts.

Migratory fish species of conservation concern, including Atlantic salmon, sea trout, river lamprey, sea lamprey, and twaite shad, are unlikely to occur within the immediate construction footprint. The predicted noise zones (Section 12.3.4) do not extend far enough to pose barriers to migration or overlap with known migratory corridors. Additionally, baseline conditions already involve high levels of vessel activity and anthropogenic disturbance (Section 12.3.4).

Table 12.9: Summary of Ecological Valuation and Evaluation of KERs within the Proposed Development Fish, Shellfish and Turtle Ecology Study Area

Receptor	Conservation Status / Listing	Ecological Role (Spawning / Nursery / Migration)	Presence in ZoI (Desk Study)	Receptor Value	KER Evaluation
Atlantic Salmon (*Salmo salar*)	Annex II EU Habitats Directive, Red-listed Ireland	Anadromous migratory species	Potential migration via Slaney Estuary	International	Listed on Annex II of the EU Habitats Directive and considered of International Importance. While Atlantic salmon migrate through estuarine areas nearby, there is no direct use of Rosslare Europort or its immediate coastal waters as a migratory corridor. Predicted underwater noise and construction zones are highly localised, do not overlap with known migration routes, and will not act as a barrier. Given the mobility of the species, low sensitivity to underwater noise, limited spatial extent of impacts, and high baseline disturbance in Rosslare Harbour, Atlantic salmon is **not considered a KER for this assessment**.
Twaite Shad (*Alosa fallax*)	Annex II, Red-listed in Ireland	Anadromous spawner in estuaries	Potential migration via Wexford	International	Although Annex II-listed and known from the River Slaney, the *ZoI* from construction (both sediment and noise) is highly localised and remains confined within Rosslare Harbour. No

Receptor	Conservation Status / Listing	Ecological Role (Spawning / Nursery / Migration)	Presence in ZoI (Desk Study)	Receptor Value	KER Evaluation
			Harbour to Slaney River		overlap with critical spawning or migration routes. Highly mobile species. **Not a KER** — No viable source–pathway–receptor linkage; negligible risk of significant effect.
Sea Trout (*Salmo trutta*)	National species of conservation concern	Anadromous migratory species	Potential migration via Wexford Harbour	National	Nationally important migratory fish species. Although potential migratory routes exist nearby, Rosslare Europort does not provide critical habitat. The ZoI is highly localised and will not present a migratory barrier. Given the species' mobility, low sensitivity to underwater noise and limited spatial interaction with the Proposed Development, sea trout is **not considered a KER for this assessment**.
River Lamprey (*Lampetra fluviatilis*)	Annex II EU Habitats Directive	Anadromous migratory species	Potential migration via Wexford Harbour	International	Migratory species that uses transitional waters, but again, Rosslare Harbour is not known habitat. ZoI do not overlap estuarine migration pathways, and species has low sensitivity to underwater noise.

Receptor	Conservation Status / Listing	Ecological Role (Spawning / Nursery / Migration)	Presence in ZoI (Desk Study)	Receptor Value	KER Evaluation
					Not a KER — No overlap with migratory routes or resting/holding areas.
Sea Lamprey (*Petromyzon marinus*)	Annex II EU Habitats Directive	Anadromous migratory species	Potential migration via Wexford Harbour	International	Also Annex II-listed and known to occur in transitional and coastal waters. This species exhibits a parasitic adult phase, often attaching to large migratory fish such as salmon or sea trout. As the modelled impacts do not affect host species, and the impact area is very localised, sea lamprey are not expected to be exposed to significant effects. Species has low sensitivity to underwater noise **Not a KER** — No overlap with migratory routes or resting/holding areas.
Freshwater Pearl Mussel (*Margaritifera margaritifera*)	Annex II EU Habitats Directive, Red-listed Ireland	Indirect dependence on salmonid hosts	No direct presence in marine ZoI	International	**Not a KER.** No direct or indirect pathway of effect given ruling out of key host salmonid fish (Atlantic salmon and sea trout) as KERs.

Receptor	Conservation Status / Listing	Ecological Role (Spawning / Nursery / Migration)	Presence in ZoI (Desk Study)	Receptor Value	KER Evaluation
Ocean Sunfish (*Mola mola*)	Appendix II (CITES, CMS) Vulnerable globally (IUCN Red List) but not regionally threatened in Irish waters due to its rarity.	Pelagic species	Very rare in Irish Sea; no local records	International /Regional	**Not a KER.** Very low likelihood of presence in ZoI; no impact pathway; no evidence of ecological sensitivity to proposed activities.
European Eel (*Anguilla anguilla*)	IUCN Red List: Critically Endangered; CITES Appendix II; OSPAR listed; Bern Convention Appendix III	Catadromous migratory lifecycle; juvenile glass eel stages migrate inland via estuaries	Potential juvenile presence in estuarine/coastal areas; no site-specific records within the Proposed Development Zone	International	Although critically endangered and legally protected (IUCN, CITES), the European eel is not listed under the EU Habitats Directive, however, it is protected under the EU Eel Regulation (1100/2007). The ZoI may intersect with early life-stage dispersal zones (e.g., glass eel migration), but no evidence of site-specific use or habitat features has been identified. Given the highly localised and shallow nature of construction impacts, the lack of known eel habitat or migratory constraints in the area, and low sensitivity to underwater noise, the species is **not considered a KER for this assessment**.

Receptor	Conservation Status / Listing	Ecological Role (Spawning / Nursery / Migration)	Presence in ZoI (Desk Study)	Receptor Value	KER Evaluation
Other Marine Teleost Fish (e.g., cod, whiting, sprat, lemon sole, herring, horse mackerel, mackerel)	Various conservation/commercial listings	Nursery and spawning habitat	Overlap with spawning and nursery areas	Regional / National	**KER.** Direct overlap with nursery/spawning areas; behavioural disturbance possible. Includes ecologically and commercially important species, some of which (e.g., sandeel, herring) exhibit high sensitivity to sound or sedimentation during spawning. May use habitats in and around the Proposed Development.
Commercially Important Shellfish (e.g., Nephrops, whelk, brown crab, scallop, velvet crab)	Various SIs and regulations	Foraging and growth habitat	Confirmed presence in ZoI	Regional / National	**KER.** Ecological function and commercial relevance; sensitive to seabed disturbance.
Nursery and Spawning Grounds for	Not individually listed; based on Marine Institute and ICES data for managed stocks (e.g.,	Critical life-stage habitats (nursery/spaw	Direct overlap with spawning and/or nursery	Regional / National	Mapped data from Ireland's Marine Atlas and ICES indicate spatial overlap between the Proposed Development Boundary and

Receptor	Conservation Status / Listing	Ecological Role (Spawning / Nursery / Migration)	Presence in ZoI (Desk Study)	Receptor Value	KER Evaluation
Commercially Important Fish and Shellfish	cod, whiting, Nephrops, lemon sole, sprat, herring, horse mackerel, mackerel)	ning) for multiple commercial taxa	areas for Nephrops, lemon sole, sprat, cod, whiting, horse mackerel, mackerel, and herring		spawning/nursery grounds. While Rosslare is a highly modified environment and baseline conditions are dynamic, the ecological significance of these early life-stage habitats supports their inclusion within the assessment. This assessment considers spawning and nursery grounds as ecologically important functions of the fish and shellfish KERs and evaluates impacts on these life-history stages where relevant to the sensitivity and spatial distribution of each receptor group. Potential pressures include sedimentation and turbidity during construction, with particular relevance to sensitive larval stages.
Blue Shark	IUCN: Near Threatened (global); CITES Appendix II; CMS Appendix II	Wide-ranging pelagic predator	No site-specific records; not recorded during ObSERVE	International /Regional	Blue sharks are regularly recorded in Atlantic waters but are absent from the Irish Sea in aerial and VP surveys. Given their offshore distribution and lack of evidence for presence near the

Receptor	Conservation Status / Listing	Ecological Role (Spawning / Nursery / Migration)	Presence in ZoI (Desk Study)	Receptor Value	KER Evaluation
			Phase I or II in Irish Sea		Proposed Development, they are **not considered KERs**.
Basking Shark (*Cetorhinus maximus*)	IUCN: Endangered; CITES Appendix II; CMS Appendices I & II; Wildlife Acts (Ireland); Bern Convention Appendix II	Migratory planktivore; seasonal coastal forager	Rarely recorded in Irish Sea (Stratum 5); only one IWDG record in past decade near Tuskar Rock; not recorded during site-specific surveys	International	Despite their legal protection and global concern status, basking sharks are not regularly present in the Irish Sea or near Rosslare. Lack of detection and no source–pathway–receptor link support exclusion as a KER – **not considered KERs**.
Other Elasmobranchs (e.g., lesser-spotted	IUCN listings vary by species (e.g., *R. clavata*: Near	Demersal species; egg-	Recorded or expected in beam trawl and	National	These species are present or expected in low densities based on fisheries data. However, there is no evidence of the ZoI overlapping with critical habitats (e.g., nursery grounds or egg-laying

Receptor	Conservation Status / Listing	Ecological Role (Spawning / Nursery / Migration)	Presence in ZoI (Desk Study)	Receptor Value	KER Evaluation
catshark *Scyliorhinus canicula*, thornback ray *Raja clavata*, spotted ray *Raja montagui*, nursehound *Scyliorhinus stellaris*), lesser spotted dogfish (*Scyliorhinus canicular*), Starry Smooth-hound (*Mustelus asterias*), Spurdog (*Squalus acanthias*), Tope	Threatened; *S. canicula*: Least Concern)	laying; benthic predators	groundfish surveys within the wider Irish Sea; no evidence of key nursery or spawning areas in or adjacent to the Proposed Development		sites), and no sensitive life stages were recorded during surveys. Given their generalist habitat use and lack of ecological vulnerability at this site, they are **not considered KERs**.

Receptor	Conservation Status / Listing	Ecological Role (Spawning / Nursery / Migration)	Presence in ZoI (Desk Study)	Receptor Value	KER Evaluation
(*Galeorhinus galeus*)					
Marine turtles (e.g., leatherback *Dermochelys coriacea*)	IUCN: Vulnerable; CITES Appendix I; CMS Appendix I; Bern Convention Appendix II	Migratory pelagic species; may pass through Irish waters	Extremely rare in Irish Sea; only 3 sightings during ObSERVE Phase II (none in ZoI); no VP records	International	Turtles are exceptionally rare in the Irish Sea and highly unlikely to occur near the Proposed Development. No risk of significant interaction or impact identified. **Not considered a KER**.

Based on a comprehensive review of baseline data - including desk study findings, benthic survey results, and regional aerial survey records from the ObSERVE programme - the following receptors have been identified as KERs and are taken forward for detailed assessment in this chapter, owing to their confirmed or potential occurrence within the ZoI and their ecological, commercial or conservation importance:

- Other Marine Teleost Fish (e.g., cod Gadus morhua, whiting Merlangius merlangus, sprat Sprattus sprattus, herring Clupea harengus, lemon sole Microstomus kitt)
- Commercially Important Shellfish (e.g., brown crab Cancer pagurus, scallop Pecten maximus, common whelk Buccinum undatum, velvet swimming crab Necora puber, Nephrops norvegicus)
- Nursery and Spawning Grounds of Commercial Fish and Shellfish (e.g., Nephrops, lemon sole, cod, whiting, sprat, herring, horse mackerel, mackerel)

All other receptors considered during the baseline review - including anadromous and catadromous migratory fish, elasmobranchs (e.g., small-spotted catshark, rays, lesser spotted dogfish, starry smooth-hound, spurdog and tope), marine turtles (e.g., *Dermochelys coriacea*), and large pelagic species (e.g., blue shark, ocean sunfish) - have been screened out on the basis of low likelihood of occurrence within the ZoI, absence of recent records, or lack of a viable S–P–R link to the Proposed Development.

12.5.3 "DO-NOTHING" SCENARIO

The *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* from the Environmental Protection Agency (EPA, 2022) emphasise the importance of considering the "Do-Nothing" scenario when evaluating potential environmental impacts.

In this EIAR, the "Do-Nothing" scenario refers to the evolution of the baseline environment in the absence of the Proposed Development.

Under this scenario, the Proposed Development would not proceed, and the current environmental conditions for fish and turtle species within the ZoI would remain unaffected by any new construction or operational activities. There would be no additional disturbance to benthic habitats, water quality, underwater noise levels, or coastal habitats beyond those currently occurring from existing port operations.

Fish species would continue to utilise available habitats within and around Rosslare Harbour, including estuarine and nearshore zones, without additional pressures from piling, dredging, reclamation, or increased vessel activity associated with the Proposed Development. Similarly, any incidental or occasional presence of sea turtles within the ZoI would continue to be influenced by natural factors or existing regional maritime activity rather than development-related pressures.

As such, the "Do-Nothing" scenario would result in no change to fish, shellfish and turtle ecology within the Study Area. Seasonal ecological processes - such as spawning, migration, and foraging patterns - would persist, following current natural cycles and responses to prevailing environmental conditions.

However, ongoing and future environmental pressures unrelated to the Proposed Development - including climate change, water pollution, habitat degradation, invasive species, and stock dynamics - could continue to influence local fish communities and the wider marine ecosystem over time. For example, the cumulative effects of existing harbour activity (e.g., maintenance dredging, vessel traffic) and regional pressures (e.g., land-based runoff, fisheries pressure) may continue to shape species composition, abundance, and habitat quality in the longer term.

The baseline conditions for fish, shellfish and turtle ecology, as described in Section 12.4.2, reflect an environment already subject to anthropogenic influence, given the commercial nature of Rosslare Europort and surrounding land use designations (see Chapter 6: Project Description). These influences are likely to persist under the "Do-Nothing" scenario, and future ecological changes would therefore reflect a continuation of established trends shaped by existing and anticipated background pressures rather than by the Proposed Development itself.

12.5.4 PRIMARY MITIGATION

This section outlines specific aspects of the project design that inherently reduce the potential for ecological effects on fish and shellfish receptors during the construction phase.

12.5.4.1 CONSTRUCTION PHASE

Perimeter Bund and Noise Attenuation Measures

As an integrated design feature, a perimeter bund of rockfill will be constructed over 8 months prior to piling activities, which are anticipated to last for up to 18 months. This bund will provide a physical barrier between the underwater noise produced by the piling operations and the open marine environment, serving both structural and environmental functions. It allows piling to occur using land-based equipment while significantly attenuating underwater noise propagation.

The bunds will be progressively constructed along the alignments of ORE Berth 1 and ORE Berth 2 quay walls, facilitating rotary bored piling from land. As the quay wall construction progresses, the bund will be excavated and repositioned, ensuring that all piling occurs within a partially enclosed area. This bunded approach is expected to substantially reduce underwater noise transmission into surrounding open water when compared to traditional offshore piling techniques.

For fish receptors, this reduction in underwater noise is particularly relevant. Many species are sensitive to high-amplitude impulsive sounds, which can cause startle responses, displacement, or in extreme cases, barotrauma. The use of a physical barrier to limit the propagation of underwater sound is likely to reduce the spatial extent of any temporary behavioural disturbance or displacement effects on mobile fish species. As such, this integrated feature significantly lowers the potential risk to fish populations in the vicinity of the Proposed Development.

Rotary Bored Piling Technique and Noise Reduction

The bearing piles for the two main quays will generally comprise rotary bored piles due to the presence of underlying rock that does not ideally allow for impact driving. Rotary bored piling uses a rotary drilling technique to remove spoil from the ground inside a temporary steel casing. Once solid rock is encountered, the casing is stopped, and rock drilling tools continue to create a socket in the rock. The permanent pile is then installed and grouted into position, after which the temporary casing is extracted and reused. This technique is notably quieter than conventional impact piling, as it avoids percussive hammering and instead relies on slower, controlled rotary excavation.

Combined with the construction of the perimeter bund, the risk of sound transfer into the marine environment is further reduced compared to piling from a barge. This is particularly relevant for fish species that are more sensitive to particle motion than pressure alone (Popper & Hawkins, 2019). Therefore, the potential for physiological damage or significant behavioural disturbance to fish is reduced. For these reasons, underwater noise generated by the rotary bored piling approach is not expected to give rise to significant effects on fish ecology.

Rock Blasting Approach

As part of the Proposed Development, rock blasting may be required along the quay wall to facilitate the installation of infill sheet piles between the main bearing piles. The method assumes that a line of retaining wall along the quay face will be pre-drilled and blasted using explosives to fracture the underlying rock. All drilling and blasting work will be conducted from the dry, rock-filled platform laid along the quay wall. The presence of a rock overburden platform (approx. +4 mCD) will act as a natural dampening layer, reducing blast vibrations and minimising noise propagation into the surrounding environment. To ensure controlled execution and minimise environmental impacts, each blast will be spaced approximately 2–3 weeks apart, progressing sequentially along the quay wall to allow for installation of the main quay wall bearing piles.

12.5.5 TERTIARY MITIGATION

The International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/785), is an international marine environmental convention which aims to prevent both operational and accidental discharge into the marine from sea going vessels. Ireland ratified the various elements of the MARPOL Convention through the Sea Pollution Act 1991, the Sea Pollution (Amendment) Act 1999 and the Sea Pollution (Miscellaneous Provisions) Act 2006. MARPOL 73/78 was given further legal effect through Statutory Instruments introduced under these Acts. The Acts place a legal obligation upon operators of vessels to implement measures to prevent both operational and accidental discharges from ships of substances, which may damage the marine environment as well as human health.

The construction and operational activities will result in an increase in vessels and therefore a potential risk of accidental spills however an incidence of pollution whether from an accidental occurrence or operational activities is not considered likely considering the legal obligations to comply with MARPOL 73/78.

Additional tertiary mitigation measures relevant to fish, shellfish and turtle ecology receptors are set out to mitigate the potential for the accidental release of pollutants including hydrocarbons and cementitious material during the construction phase by Chapter 7: Soils, Geology, Hydrogeology and Contamination, Chapter 9: Water Quality and Flood Risk of this EIAR and the outline Construction Environmental Management Plan (oCEMP) which accompanies this application.

12.5.6 CONSTRUCTION PHASE IMPACTS

This section assesses the potential impacts of construction-phase activities on fish and shellfish receptors. Key impacts considered are:

- underwater noise
- temporary and permanent habitat disturbance and loss (including loss of foraging habitat)
- increased suspended sediment

12.5.6.1 UNDERWATER NOISE IMPACTS

Construction activities such as piling, dredging, and potential rock blasting are anticipated to generate underwater noise capable of affecting fish species through mechanisms including behavioural disturbance, TTS in auditory sensitivity, and, in rare cases, injury. The likelihood and significance of these impacts depend on species-specific hearing sensitivity, proximity to the sound source, and the acoustic characteristics of the construction methods employed (Popper *et al*., 2014; Slabbekoorn *et al*., 2010).

Fish species vary in their sensitivity to underwater noise according to auditory anatomy. Species with swim bladders connected to the inner ear (e.g., clupeids) are more sensitive to sound pressure, whereas generalist teleosts and elasmobranchs primarily respond to particle motion (Popper and Hawkins, 2019). Underwater noise may also induce stress-related physiological effects, particularly during sensitive life stages (Hawkins *et al*., 2014).

Recent scientific reviews have emphasised the need to evaluate underwater noise impacts on fishes and invertebrates independently from marine mammals, due to fundamental differences in anatomy, behaviour, and acoustic sensitivity (Hawkins and Popper, 2017). Fishes and shellfish detect underwater sound primarily through particle motion rather than sound pressure and commonly used acoustic metrics – such as SPL and SELcum – may not adequately reflect biologically relevant exposure. In addition, seabed-coupled interface waves (e.g., "ground roll") generated by activities like piling can induce substantial particle motion over extended distances, with particular relevance for benthic invertebrates and demersal fish. These effects may result in masking of biologically important cues, stress-related physiological responses, disruption to feeding or reproductive behaviour, and, in extreme cases, physical injury. Given these considerations, the current assessment draws on best available guidance (Popper *et al.,* 2014; Hawkins and Popper, 2017) while acknowledging data limitations, particularly regarding invertebrate sensitivity to substrate-borne vibration.

Fish Sensitivity to Noise

Marine teleost fish exhibit a range of auditory sensitivities linked to their anatomical adaptations. Clupeids (e.g., herring, sprat) possess swim bladders that are mechanically connected to the inner ear, rendering them highly sensitive to sound pressure and broadband noise. In contrast, other species - including gadoids and flatfish - detect a combination of sound pressure and particle motion but with more limited frequency ranges and lower overall sensitivity (Popper & Hawkins, 2019).

Early life stages, such as larvae of cod, whiting, lemon sole, and mackerel, may be especially vulnerable to disturbance due to undeveloped avoidance behaviour and the importance of acoustic cues during development (Hawkins et al., 2014; Hawkins & Popper, 2017).

Shellfish Sensitivity to Noise

Benthic invertebrates, including Nephrops and other commercially important shellfish, are not currently assessed as sensitive to underwater noise under the Marine Evidence–based Sensitivity Assessment (MarESA), reflecting a general scientific consensus that these species exhibit limited responsiveness to acoustic pressures in the marine environment. Although not vulnerable to auditory injury in the conventional sense, some laboratory studies have documented a range of physiological and behavioural responses in crustaceans and bivalves exposed to substrate vibration and low frequency noise, including startle responses, reduced foraging, metabolic stress and altered burrowing behaviour (Day *et al*., 2016; Hawkins & Popper, 2017; Wang et al., 2022). However, these effects have primarily been observed under controlled conditions and their ecological relevance *in situ* remains unclear. Particle motion and seabed-coupled interface waves ("ground roll") generated by piling can propagate over long distances, but the extent to which these influence benthic invertebrates in the marine environment is not yet clearly understood.

Nursery and Spawning Grounds

The Proposed Development and the underwater noise ZoI overlap directly with mapped spawning and nursery grounds for several commercially important fish and shellfish species, including cod, whiting, lemon sole, sprat, Nephrops, herring, horse mackerel, and mackerel (see Section 12.4.6). These life stages – particularly eggs and larvae – are known to exhibit heightened sensitivity to acoustic and physical disturbance. Noise modelling predicts that potential mortal injury thresholds may be exceeded for fish eggs and larvae up to 150 m from piling (cSEL), up to 105 m from rock blasting (zero-to-peak SPL), and within 10 m from dredging (cSEL). While auditory injury thresholds may be exceeded within short distances, no critical spawning grounds or high-density larval aggregations have been identified within the affected zones. These life stages are generally not site-faithful and tend to occur at low densities within the area (Popper *et al.,* 2014).

Importantly, piling will be undertaken using rotary bored methods within bunded or semi-enclosed structures, significantly reducing sound propagation (by an estimated 10–30 dB; DAHG, 2014). The use of low-energy piling techniques and the localised nature of works also reduce the likelihood of widespread impacts. Given the lack of evidence for high-density spawning aggregations or sensitive developmental stages within the immediate area, the potential for effects on spawning and nursery grounds is expected to be localised.

Predicted Noise Exposure and Effects

Noise modelling assumed a hammer operating at a maximum energy of 240 kJ. The analysis considered both zero-to-peak sound pressure level (SPL) and cumulative sound exposure level (cSEL), with thresholds applied for potential mortal injury, recoverable injury, and temporary threshold shift (TTS).

- Zero-to-peak SPL thresholds for potential mortal or recoverable injury may be exceeded up to:
    - 46 m for fish with swim bladders (whether involved in hearing or not)
    - 17 m for fish with no swim bladder
    - 46 m for fish eggs and larvae
- cSEL thresholds were not exceeded for any mobile fish groups (assumed swim speed: 1.5 m/s).
- However:
- For stationary fish eggs and larvae, potential mortal injury may occur within a range of up to 150 m
- TTS thresholds were exceeded within 10 m for all mobile fish groups

The risk of permanent or recoverable injury to adult or juvenile fish from piling is limited to within 46 m of the source (i.e.,. zone of impact), with immobile eggs and larvae potentially affected up to 150m. Temporary hearing impairment (TTS) may occur at close range (≤10 m). The most sensitive groups include fish eggs and larvae and species with swim bladders mechanically linked to the inner ear (Group 4), such as clupeids (e.g., herring, sprat, shad) which are likely to occur in the wider Irish Sea.

12.5.6.2 DREDGING

Noise levels predicted during dredging activities were significantly lower than for piling and blasting. Modelling indicated that none of the zero-to-peak SPL thresholds or cSEL thresholds were exceeded for mobile fish (swimming at 1.5 m/s).

For fish eggs and larvae, cSEL thresholds for potential mortal injury may be exceeded within 10 m of the dredging activity

The risk of injury or hearing loss to adult or juvenile fish from dredging is considered negligible. However, there is a very localised risk (≤10 m) of injury to fish eggs and larvae, which may be present in benthic habitats near the dredging footprint. Given the limited spatial extent, this impact is not expected to result in population-level effects.

12.5.6.3 ROCK BLASTING

Modelling compared predicted zero-to-peak SPLs to the Popper et al. (2014) injury thresholds for impulsive sources. The injury threshold of 229 dB re 1 µPa for all fish groups was potentially exceeded up to:

- 105 m, with a lower–upper bound range of 30–170 m based on modelling uncertainty

There is a moderate risk of injury to fish species, including eggs and larvae, within 105 m of blasting activities. As with piling, species with swim bladders involved in hearing and immobile early life stages are considered most at risk. However, the limited number of blasting events, combined with their short duration, means that the overall impact is expected to be localised and temporary.

12.5.6.4 SUMMARY

The results of the noise modelling outputs provide spatial estimates of potential injury zones (zone of impact) for each activity and receptor type. Table 12.10 below summarises the predicted impacts on different fish groups and life stages, identifying those most at risk and the activities likely to result in threshold exceedances. These spatial predictions are further illustrated in Figure 12.17, which presents the maximum distances to threshold exceedance for each fish group and activity, highlighting the relative sensitivity of early life stages and species with hearing-specialised swim bladders.

This summary informs the impact significance and mitigation measures presented in subsequent sections.

Table 12.10: Summary of Affected Receptors from Noise Modelling

Fish Group	Most Likely to Be Affected	Most Sensitive Phase	Key Impacted Activities
Fish with swim bladder involved in hearing	E.g. herring, sprat, shad	All life stages	Piling: 46 m (SPL), Rock Blasting: 105 m (range 30–170 m
Fish with swim bladder not involved in hearing	E.g. gadoids (cod, haddock), seabass	Juvenile and adult	Piling: 46 m (SPL), Rock Blasting: 105 m (range 30–170 m)
Fish with no swim bladder	E.g. elasmobranchs	Juvenile and adult	Piling: 17 m (SPL), Rock Blasting: 105 m (range 30–170 m)
Fish eggs and larvae	All species	Early life stage	Piling (150 m cSEL), Rock Blasting: 105 m (SPL), Dredging (10 m cSEL)

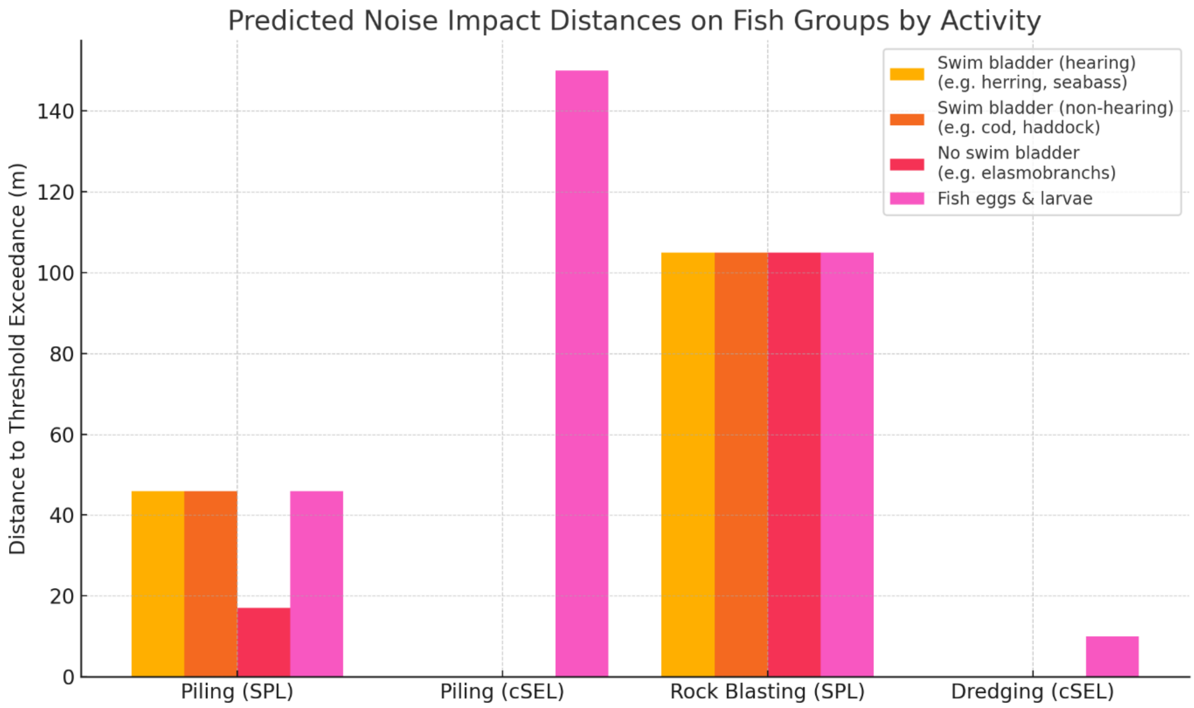

Figure 12.17: Predicted distances to injury or hearing threshold exceedance for fish groups and life stages during piling, rock blasting, and dredging activities, based on noise modelling results

*Distances reflect the maximum extent at which injury or TTS thresholds (Popper *et al*., 2014) may be exceeded. Piling impacts include both zero-to-peak SPL and unweighted cSEL thresholds. Eggs and larvae are most sensitive to cSEL during piling and dredging due to their immobility. Rock blasting thresholds apply across all groups at a predicted range of 30–170 m (mean 105 m).

Noise modelling for the Proposed Development predicts that zero-to-peak SPL and cSEL thresholds for potential injury or TTS will not be exceeded for any mobile fish groups during piling, dredging or blasting, assuming a swim speed of 1.5 m/s (Popper *et al*., 2014). The only exceedance is predicted for stationary fish eggs and larvae, with potential mortal injury up to 150 m from piling, 105 m from blasting (range: 30-170 m) and 10 m of dredging.

Piling will employ rotary bored techniques, a non-impulsive method known to generate substantially lower underwater noise than impact piling. Furthermore, these activities will occur within bunded or semi-enclosed structures (e.g., the reclaimed berth and small boat harbour), which are expected to attenuate underwater noise transmission by approximately 10–30 dB (DAHG, 2014), further reducing the spatial extent of potential effects.

Anticipated Effects on KERs

For Commercially Important Shellfish, displacement is unlikely due to their benthic ecology. While some literature suggests that low frequency noise may affect the behaviour of burrowing fauna in controlled laboratory experiments (Day *et al*., 2016; Hawkins & Popper, 2017; Wang *et al* 2022), there is limited evidence on the effects of underwater noise on marine benthic species within the marine environment. The majority of benthic invertebrates, including shellfish, have limited or no known response to noise, although vibrations in the water column, at close proximity, may result in an avoidance response. Therefore, these impacts are considered to be minor and **not significant** for shellfish.

Underwater noise generated during construction is not expected to result in auditory injury to any mobile life stages of fish or shellfish. Effects on *Spawning and Nursery Grounds* are predicted to be temporary, localised, and fully reversible. Given the confined spatial footprint of works, integrated mitigation (e.g., use of non-impulsive rotary bored piling, construction within bunded areas), and the mobility or resilience of KERs, this impact is assessed as **not significant**.

For *Other Marine Teleost Fish*, short-term behavioural responses such as startle reactions and avoidance are the most likely outcomes. Modelled distances to TTS thresholds are limited to 10 m, and fish are expected to return to previously occupied habitats once works cease. These responses are considered **not significant**, particularly given existing anthropogenic disturbance and localised noise attenuation.

12.5.6.5 TEMPORARY AND PERMANENT HABITAT DISTURBANCE OR LOSS

The construction phase of the Proposed Development will result in both temporary and permanent changes to subtidal habitat within and adjacent to Rosslare Europort. These changes arise from dredging works and land reclamation, which together affect a total seabed area of approximately 76.1 ha.

Temporary Disturbance from Dredging

Dredging will be undertaken over 15 months across 48.4 ha of seabed to deepen approach channels and berth pockets, and to supply fill material for land reclamation over . This will result in the temporary removal of surface sediments, resuspension of particles, and short-term disruption to benthic communities and localised displacement of demersal fish.

The dredge footprint is composed of mixed sediments and glacial till, within an already operational port environment. Baseline benthic surveys confirm that these habitats are of low ecological sensitivity and do not support high-value or protected benthic communities. Accordingly, temporary disturbance is not predicted to significantly affect either of the fish or shellfish KERs.

Species within the Other Marine Teleost Fish group - such as whiting (*Merlangius merlangus*), sprat (*Sprattus sprattus*), and juvenile flatfish - are expected to temporarily avoid the affected areas during active dredging and return following cessation of works. Similarly, individuals from the Commercially Important Shellfish group - including Nephrops, whelk, and brown crab - may exhibit short-term behavioural responses such as reduced foraging or limited displacement within the local area. Recovery of benthic faunal communities is anticipated within months to a few years following cessation of dredging, depending on local sediment dynamics and recruitment processes (Dernie *et al*., 2003).

Although the affected area overlaps with mapped nursery and spawning grounds for several commercially important species (e.g. *Nephrops*, whiting, lemon sole, and sprat), the habitats present do not exhibit the characteristics typically associated with high-value spawning or juvenile settlement areas. This conclusion is supported by findings from Chapter 11: Benthic Ecology, which confirms that the dredge footprint consists of mixed and disturbed sediments lacking structural complexity or biogenic habitat features. Given these baseline conditions - within a highly dynamic, operational port environment already subject to routine physical disturbance - the temporary loss of habitat in these areas is therefore considered **not significant**.

Permanent Habitat Loss due to Proposed Land Reclamation and Presence of Port Foundations

A total of 27.7 ha of subtidal habitat will be permanently lost due to land reclamation for ORE support infrastructure. This will involve the filling of soft-substrate seabed with dredged material contained within a constructed rock bund, resulting in the permanent loss of subtidal habitat through conversion to terrestrial infrastructure.

Baseline characterisation indicates that the affected habitat comprises previously disturbed, low-complexity sediment without notable structural features or sensitive benthic communities (see Chapter 11: Benthic Ecology). While the area lies within broader nursery grounds for certain marine teleost species (e.g., whiting, sprat, lemon sole), the specific footprint of the Proposed Development – a busy port - lacks habitat features typically associated with high-value nursery or spawning areas (e.g., sediment type, bathymetry, or shelter). Spatial datasets from the Marine Institute and ICES (via Ireland's Marine Atlas; EIAR Technical Appendix 12) indicate that spawning and nursery activity for these species is diffuse at the regional scale, and there is no evidence that the area supports persistent or functionally important aggregations.

Similarly, although commercially important shellfish (e.g., Nephrops, brown crab) may occur in the general vicinity, no aggregations or optimal habitat features (e.g., burrow density, muddy substrates) were observed within the reclamation zone. The benthic habitats affected are dominated by sandy and gravelly sediments, with biotopes such as SS.SSa.CMuSa.AalbNuc and SS.SMx.IMx.MedCirr, which do not constitute preferred spawning or nursery grounds for these shellfish taxa.

Therefore, the permanent loss of habitat is not considered significant in terms of population viability, spawning success, or broader ecological function for either Other Marine Teleost Fish, Commercially Important Shellfish, or associated nursery and spawning grounds.

Epibenthic and infaunal communities within the footprint of the Proposed Development may be subject to disturbance from construction-related activities such as entrainment, habitat modification, underwater noise, contaminant remobilisation, increased suspended sediments, and sedimentation. These pressures have the potential to alter benthic community structure and biomass, which may influence prey availability for demersal or benthic-feeding fish species.

However, the habitats present within and surrounding the Proposed Development Site are typical of dynamic, shallow estuarine and coastal systems, characterised by sandy and muddy sediments supporting a high proportion of opportunistic benthic species. Such communities are naturally adapted to periodic disturbance and typically exhibit rapid recovery following physical impacts (Newell *et al*., 1998; Dernie *et al*., 2003). These areas also support a variety of forage species and invertebrates that form part of the diet of ecologically and commercially important fish species (see Chapter 11: Benthic Ecology of this EIAR).

Most fish species present in the area exhibit generalist feeding behaviours and are not reliant on any single prey type or foraging area. Additionally, alternative foraging habitats of similar type and ecological function are available throughout Rosslare and Wexford Harbour and the wider coastal environment. Given the availability of suitable alternative habitats, the dynamic nature of the benthic community, and the dietary flexibility of fish species present, the potential for meaningful ecological impact on fish populations through changes in prey availability is low.

As such, the potential loss or degradation of foraging habitat due to reduced prey availability is not considered significant.

Anticipated Effects on KERs

The construction phase will result in both temporary disturbance and permanent loss of seabed habitat. However, these impacts occur in a highly modified and low-sensitivity environment, and no critical ecological features for the two KERs have been identified within the affected footprint. Spawning and nursery grounds within the Regional Study Area are spatially extensive and not reliant on the habitat within the Proposed Development Boundary. The receptor groups are expected to exhibit resilience - through mobility and widespread spawning behaviours in teleost fish, or recolonisation potential and functional redundancy in shellfish populations. Therefore, the overall impact of habitat disturbance and loss is assessed as **not significant for all KERs**.

12.5.6.6 INCREASED SUSPENDED SEDIMENT AND SEDIMENTATION

Dredging and reclamation activities associated with the construction phase of the Proposed Development will result in localised resuspension of seabed material, temporarily elevating turbidity and increasing sediment deposition in the immediate vicinity of active operations.

Suspended Sediment Concentration (SSC)

- The modelling predicted maximum SSC increases of 15–20 mg/l within the harbour and immediately adjacent to the weirbox outflow.
- The spatial extent of SSC elevations in Stage 3 (the worst-case scenario) was predicted to reach up to 1.5 km westwards toward Rosehill Bay Beach and up to 2.5 km southeast toward Greenore Point.
- All other surrounding Natura 2000 sites, including Carnsore Point SAC, Long Bank SAC, Blackwater Bank SAC, and Slaney River Valley SAC, were predicted to experience maximum SSC increases of only 3–9 mg/l.
- Given these concentrations and their limited extent/duration, no significant impacts to fish or shellfish receptors are expected.

Bed Thickness Changes (Smothering Potential)

- The greatest predicted bed level change occurred at the weirbox during Stage 1, reaching 8 cm, qualifying as 'heavy' smothering under MarESA pressure benchmarks.

- All other predicted bed thickness changes at Natura 2000 sites, including Carnsore Point SAC, were ≤0.04 cm, qualifying as 'light' smothering, which most benthic and demersal species can tolerate or recover from.
- Negligible smothering risk was predicted for spawning or nursery habitats of fish or mobile invertebrates, with no measurable impact anticipated on turtle species due to their absence from the zone of influence.

Sediment dispersion modelling predicts that suspended sediment concentrations will remain moderate (15–20 mg/l), with spatially restricted plumes extending up to 2.5 km from the weirbox outflow and rapidly attenuating with distance. Predicted bed deposition thicknesses across the wider area are ≤0.04 cm, qualifying as 'light smothering', with higher values (up to 8 cm) only occurring directly at the weirbox (see Chapter 8: Coastal Processes). These pressures may influence ecological receptors by altering water clarity, reducing light penetration, smothering benthic habitats, and disrupting feeding or respiratory functions. However, the short-term duration, limited spatial extent, and absence of known spawning or nursery grounds for fish or shellfish within the maximum impact footprint reduce the likelihood of significant effects.

Other Marine Teleost Fish

Suspended sediment can affect marine teleosts through behavioural avoidance, reduced foraging efficiency, or physiological stress, particularly in larval or juvenile stages. Effects depend on sediment concentration, exposure duration, and species-specific tolerance. Documented responses include gill irritation, increased metabolic cost, and impaired visual predation success (Wenger *et al*., 2017; Kjelland *et al*., 2015). However, most fish expected in the area – such as sprat, whiting, and juvenile flatfish – are adapted to naturally dynamic environments and exhibit high mobility, allowing them to avoid suboptimal conditions and return following cessation of works.

Sediment dispersion modelling indicates that elevated concentrations will be moderate, short-lived, and spatially restricted to areas adjacent to dredging activities (see Chapter 8: Coastal Processes). As such, exposure is unlikely to result in sustained physiological stress or affect essential behaviours such as foraging or movement at a population level.

Spatial datasets from the Marine Institute and ICES (via Ireland's Marine Atlas) indicate the presence of broader nursery areas for several marine teleost species in the vicinity of the Proposed Development. However, the zone of maximum predicted suspended sediment and deposition does not overlap with areas identified as high-intensity or critical nursery or spawning grounds. Additionally, the habitat within the affected footprint lacks key features typically associated with nursery function, such as structurally complex substrates, shallow bathymetry, or vegetated habitats. Therefore, no impacts to nursery or spawning functions are anticipated, and the overall impact is assessed as **not significant**.

Commercially Important Shellfish

Suspended sediment and subsequent deposition may affect benthic invertebrates by smothering feeding appendages, reducing burrow ventilation, or impairing respiration and feeding rates. While some crustaceans and molluscs are sensitive to high levels of sedimentation, species such as *Nephrops norvegicus*, whelk, and brown crab are generally tolerant of moderate turbidity and capable of clearing or avoiding localised deposition through burrowing or relocation.

Baseline benthic surveys confirm the absence of dense aggregations or optimal habitat features within the affected area (Chapter 11: Benthic Ecology). Additionally, predicted deposition thicknesses are expected to remain below thresholds known to impair survival or key functions in these taxa.

Razor clams (*Ensis siliqua* and *E. arcuatus*) are commercially targeted along sections of the southeast coast, including from Cahore to Rosslare, in soft sediment habitats typically between 4–14 m water depth (refer to EIAR Technical Appendix 12). Although no dense aggregations were identified during site-specific benthic surveys, parts of the mapped commercial fishery area may partially overlap with the outer margins of the modelled sediment dispersion plume. However, this overlap is spatially limited and localised to areas where predicted sediment deposition remains very low and below ecologically relevant thresholds (≤0.04 cm). Furthermore, the affected habitat is located within a hydrodynamically active coastal zone where natural sediment resuspension is frequent. Consequently, razor clams in the area are considered tolerant of sediment variability and unlikely to be adversely affected by the scale of sedimentation predicted.

No known shellfish spawning or nursery grounds occur within the area of maximum deposition or suspended sediment concentration. As such, the overall impact on shellfish - including *Ensis* spp. - is assessed as **not significant**.

Anticipated Effects on KERs

Although increased turbidity and sedimentation may lead to temporary and localised effects on fish and shellfish behaviour or physiology, these impacts are predicted to be sublethal, reversible, and spatially confined. Given the adaptive capacity, mobility, and environmental tolerance of the two KERs, along with the absence of sensitive life stages, nursery functions, or spawning habitats within the impact zone, the overall impact from increased suspended sediment and sedimentation is assessed as **not significant** for both Other Marine Teleost Fish and Commercially Important Shellfish, including associated nursery and spawning grounds.

12.5.7 OPERATIONAL PHASE IMPACTS

The operational phase of the Proposed Development is predicted to result in one potential impact on fish and shellfish receptors:

- habitat modification

12.5.7.1 HABITAT MODIFICATION

The operational phase of the Proposed Development will result in permanent modification of subtidal benthic habitats due to the establishment of hard infrastructure, including quay walls, berthing areas, and revetments along the perimeter of the reclaimed platform. These structures will irreversibly replace existing soft and mixed sediment substrates with artificial hard materials (e.g., concrete, rock armour).

This transition constitutes a loss of original habitat types relevant to both Other Marine Teleost Fish and Commercially Important Shellfish, which primarily utilise soft-sediment environments for foraging, burrowing, and growth. However, the affected area lies within an industrialised port environment already subject to substantial anthropogenic alteration. Baseline benthic surveys (Chapter 11: Benthic Ecology) confirm that the seabed within the footprint is dominated by disturbed or faunally impoverished biotopes with no presence of Annex I habitats, high-density shellfish aggregations, or sensitive biogenic structures.

Given the limited spatial extent of the habitat conversion relative to the wider available seabed, and the low baseline ecological sensitivity of the footprint, and the absence of essential spawning or nursery areas, this permanent habitat change is not expected to compromise the viability or functional integrity of either KER. No critical ecological dependencies on the modified area have been identified for these receptor groups.

Accordingly, the impact of operational-phase habitat modification on Other Marine Teleost Fish, Commercially Important Shellfish, and associated spawning and nursery grounds is assessed as **not significant**.

12.5.8 SIGNIFICANCE OF EFFECTS

The significance of effects on fish and shellfish KERs has been evaluated across all relevant construction and operational phase activities. Effects considered include underwater noise, habitat loss or modification, sedimentation, and water quality degradation.

All identified impacts have been assessed as **not significant** based on their predicted magnitude, duration, reversibility, and the sensitivity of the receiving environment. The affected habitats are heavily modified, do not support spawning or nursery areas of high value, and the KERs are expected to be resilient due to their mobility or capacity for recolonisation. Therefore, no adverse effects are anticipated at the population or ecosystem level.

12.6 CUMULATIVE EFFECTS

12.6.1 METHODOLOGY

While a single development may not in itself cause a significant impact on the local ecosystem, a combination of projects within a localised area may cause a negative impact. Therefore, the cumulative impacts of a project or plan in association with other projects and plans must be taken into consideration when assessing the possible impacts of a development.

Transboundary effects refer to significant effects that a Proposed Development in one country may have on the environment of another. The United Nations Economic Commission for Europe (UNECE) Convention on Environmental Impact Assessment in a Transboundary Context, (referred to as the 'Espoo Convention') adopted in 1991, documents the requirement to consider transboundary impacts. The Espoo Convention requires that assessments are extended across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary impacts.

Chapter 25: Interactions of this EIAR has considered and assessed cumulative and transboundary effects that may occur as a result of the Proposed Development.

Projects identified as having potential to act in-combination with the Proposed Development are considered to be those projects most likely to contribute to these pressures and generate the same or similar pressures to those identified. The following approach to the identification of cumulative impacts has been taken:

The geographic boundaries of the Proposed Development were reviewed.

As the proposed project is solely marine based, a search for projects with a marine component or the ability to impact the marine environment through a SPR model were considered relative to the potential for cumulative effects. In this regard all additional projects within 5 km of the PDB were considered in this review. This is considered to be reasonable and appropriate relative to the scale and scope of the proposed project.

The search was focused on projects and applications listed through the following sources:

Local Authority Planning applications, Wexford County Council Development Plan, An Bord Pleanála, Maritime Area Regulatory Authority (MARA) for applications submitted after 17th July 2023, Foreshore Unit of the Department of Housing Local Government and Heritage for applications prior to 17th July 2023, and the Environmental Protection Agency (EPA) Dumping at Sea register.

12.6.2 ASSESSMENT OF CUMULATIVE IMPACTS

Based on available information, no significant cumulative effects on fish or shellfish KERs are predicted. Although some temporary overlap with other marine-based activities (e.g., port maintenance dredging) may occur during the operational phase of the Proposed Development, the following key factors reduce the likelihood of adverse cumulative impacts:

- The spatial footprint of the Proposed Development is localised within an already modified port environment.
- Predicted underwater noise and sediment dispersion are limited in extent and duration (see Sections 12.5.6.1 and 12.5.6.6).
- Maintenance dredging at Rosslare Europort will not occur concurrently with capital dredging for the Proposed Development, thereby avoiding overlap in sediment or noise-related pressures.
- No critical spawning grounds, high-value nursery habitats, or shellfish beds of ecological or commercial concern have been identified within or adjacent to the ZoI. Spatial datasets from the Marine Institute and ICES confirm that broader spawning and nursery areas are present regionally but do not intersect with the most affected seabed areas.

These findings are further supported by the cumulative project review presented in Table 12.11, which confirms that no other relevant developments are expected to result in overlapping or synergistic effects on fish or shellfish KERs. Consequently, cumulative impacts on fish and shellfish populations are considered **not significant**.

Table 12.11: Projects considered for cumulative effects on fish and shellfish in conjunction with the Proposed Development

Project	During the Construction Phase	During the Operational Phase	Assessment outcome of cumulative effect on fish, shellfish, or turtles
Phase 1 OWF projects: • Arklow Bank Wind Park 2 • Codling Wind Park (CWP) Project • Dublin Array	No	Yes	Construction of the Phase 1 OWF projects will temporally overlap with the operational phase of the Rosslare Europort ORE Hub. Arklow Bank Wind Park 2 is located approximately 52 km from Rosslare. Given this spatial separation and the localised extent of impacts associated with the operational phase of the Proposed Development, no cumulative impacts are anticipated. Codling Wind Park (CWP) is located approximately 89 km from Rosslare. Given the distance and lack of shared seabed or ecological connectivity for the KERs, no cumulative impacts are expected. Dublin Array lies over 100 km from Rosslare. Given this distance and the localised and intermittent nature of operational phase pressures (e.g. vessel noise, EMFs), no cumulative are predicted. Overall, due to the considerable spatial separation and the limited potential for overlapping ecological pressures affecting KERs (e.g., underwater noise, benthic disturbance), the cumulative impact of the Phase 1 OWF projects in combination with the Proposed Development is considered not significant. Construction of the Phase 1 OWF projects will temporally overlap while Rosslare Europort ORE Hub will be in operation.

Project	During the Construction Phase	During the Operational Phase	Assessment outcome of cumulative effect on fish, shellfish, or turtles
Maintenance dredging at Rosslare Europort and Ballygeary Harbour, Co. Wexford	Yes	Yes	Iarnród Éireann is responsible for maintenance dredging at Rosslare Harbour, a routine activity independent of the Proposed Development. To minimise cumulative impacts, Iarnród Éireann will ensure maintenance dredging activities do not occur simultaneously with the capital dredging required for the Proposed Development. This approach will avoid cumulative effects from separate dredging operations being undertaken in close proximity to each other and at the same time, avoiding potential environmental impacts from associated elevated levels of turbidity and underwater noise being introduced into the marine environment.
Berth 3 Extension and Berth 4 Decommissioning - Iarnród Éireann (2021)			This project involved works to extend Berth 3 and decommission Berth 4 at Rosslare Europort, including replacement of the linkspan and associated marine infrastructure. It was subject to Screening for Appropriate Assessment in 2021, which concluded no likely significant effects on fish, shellfish, or turtle receptors. Given the small scale and short duration of the works, and the lack of any residual impact pathways, there is no potential for cumulative effects in combination with the Proposed Development.
Port Access Road and Freight Plaza Development – Iarnród Éireann (2020)			This project involved construction of a new main access road, internal road network, and freight entrance plaza at Rosslare Europort, including associated demolition, site works and infrastructure. The project was subject to Screening for Appropriate Assessment in 2020, which concluded no likely significant effects on fish, shellfish, or turtle receptors. As the works are terrestrial in nature with no marine component, there is no viable source–pathway–receptor link to the Proposed Development, and cumulative effects are not predicted.
Border Control Post (BCP) at Rosslare Europort –			This project involved the construction of a new BCP facility on the landside of Rosslare Europort, including roads, drainage, parking and associated infrastructure. The project was subject to EIA and no project-related impacts

Project	During the Construction Phase	During the Operational Phase	Assessment outcome of cumulative effect on fish, shellfish, or turtles
Commissioners of Public Works in Ireland (2021)			on fish, shellfish, or turtle receptors were identified. As there is no marine element, no viable source–pathway–receptor linkage exists, and no cumulative impacts are anticipated.
Relocation of Pet-Check Facilities – Commissioners of Public Works in Ireland (2022)			This project involved the relocation of a portacabin, the creation of a new lay-by, and associated minor site works within the Rosslare Europort landholding. It was subject to Screening for Appropriate Assessment and no impacts on fish, shellfish or turtle receptors were identified. As no marine interaction is expected, no cumulative impacts with the Proposed Development are anticipated.
N25 Rosslare Europort Access Road – Wexford County Council (2023)			This project was subject to EIA, and no project-related impacts on fish, shellfish or turtle receptors were recorded. As such, no potential for impact with the Proposed Development is considered possible.
South Coast Designated Maritime Area Plan (DMAP)	No	Yes	The SC-DMAP, adopted in October 2024, outlines areas for potential future offshore renewable energy (ORE) development along Ireland's south coast. While the plan identifies four maritime areas where ORE projects may proceed, no specific projects have yet been consented or constructed. As the Proposed Development is a coastal port project with a localised operational footprint, and in the absence of any active or planned ORE developments within the SC-DMAP zones, no cumulative effects on fish, shellfish or turtle receptors can currently be assessed. Should future ORE projects within the SC-DMAP area proceed, cumulative assessments will need to consider operational activities at Rosslare where relevant. However, based on current information and the spatial separation from SC-DMAP zones, no significant cumulative impacts on KERs are predicted during the operational phase of the Proposed Development.

12.6.3 ASSESSMENT OF INTERACTIONS

Interactions between individual pressures (e.g., underwater noise, sedimentation, vessel activity) have been reviewed to determine whether their combination could result in greater ecological effects on fish and shellfish than when considered in isolation.

This assessment, drawing on findings from Chapter 8: Coastal Processes, Chapter 9: Water Quality and Flood Risk, Chapter 11: Benthic Ecology, and Chapter 25: Interactions, confirms that:

- Combined effects are expected to be spatially and temporally restricted to the construction footprint and its immediate surroundings.
- Fish and shellfish receptors are either mobile (e.g. pelagic teleosts) or well-adapted to disturbance in shallow dynamic habitats (e.g. opportunistic benthic invertebrates).
- Behavioural avoidance of localised disturbance (e.g. vessel noise) reduces the potential for additive impacts.
- No critical spawning or nursery habitats are located within the area where interactive pressures are expected to occur, and no sensitive life stages are predicted to coincide with peak disturbance periods.

Accordingly, the inter-related effects from multiple construction-phase pressures are assessed **as not significant** for Other Marine Teleost Fish, Commercially Important Shellfish, and associated spawning and nursery grounds.

12.6.4 ASSESSMENT OF TRANSBOUNDARY IMPACTS

The nature and location of the Proposed Development - within Rosslare Europort, a sheltered coastal environment - limit the potential for transboundary effects.

While some mobile marine species may range across national waters (e.g., pelagic fish), the physical and acoustic impacts of construction (e.g., noise, turbidity) are predicted to be localised and do not extend beyond Irish waters. Sediment dispersion and noise modelling confirm that the spatial extent of pressure propagation remains well within the Irish EEZ and does not approach the EEZ boundary.

Given the absence of any spawning or migratory pathways of international importance within the zone of impact, transboundary impacts on fish or shellfish populations are considered **not significant**.

12.7 MITIGATION MEASURES

No additional specific ecological mitigation measures are proposed, as no significant adverse effects have been identified. Nonetheless, general environmental controls and management measures will be implemented during construction to reduce the risk of unintentional harm and ensure good ecological practice.

12.7.1 CONSTRUCTION PHASE MITIGATION MEASURES

Modelling indicates that SSC and bed thickness changes will be below levels with the potential for significant effects during construction. However, with due regard to the precautionary principle, turbidity monitors will be employed to ensure SSC levels do not exceed the predicted values.

Monitoring of turbidity in real-time will be achieved using turbidity monitors within Rosslare Europort harbour bounds to identify any increased Suspended Sediment Concentration that arises and will implement controls if the SSC limit of 300mg/l above background is breached at the monitored locations.

Monitoring will comprise one offshore buoy in a typically up-current location and another buoy in a typically down-current location corresponding to locations to the east of the dredged boundary and the north-west of the dredged boundary. The tide tends to flow east to north-west and vice-versa between flood to ebb. The buoys will be positioned approximately 300m outside the boundary of dredging and outside of regular navigation routes for RoRo vessels and construction plant. The background reading will be read from the up-current monitoring buoy and the assessment of turbidity will be read from the down-current monitoring buoy. Up-current and down-current positions must be swapped between flood and ebb tidal cycles.

This limiting control value of SSC will be correlated with Notional Turbidity Units (NTU) for samples of sediment initially recovered from the site prior to commencement. This allows instantaneous readings to be taken with real-time NTU meters on the monitoring buoys which are matched to suspended sediment values. The buoys will be set to relay real-time events (including trigger values) and warn the contractor of high values of suspended sediment.

12.7.2 RESIDUAL EFFECTS

12.7.2.1 CONSTRUCTION PHASE

Following the implementation of primary mitigation and standard environmental protection tertiary mitigation measures (e.g., MARPOL compliance), all construction-phase impacts are assessed as **not significant**. Residual effects, such as short-term noise exposure or temporary sedimentation, are expected to be localised, reversible, and ecologically negligible.

12.7.2.2 OPERATIONAL PHASE

Operational impacts are limited to the permanent modification of seabed habitat associated with the reclaimed platform and quay structures. As assessed in Section 12.5.7.1, this does not represent a significant effect due to the degraded quality of the baseline habitat, the low functional dependence of the KERs on these areas, and the potential for colonisation by marine fauna.

Accordingly, residual operational-phase effects on fish and shellfish receptors are considered **not significant**.

12.8 MONITORING

Turbidity monitoring will be implemented during the construction phase. An appropriate system of response actions will be in place should elevated SSC levels be detected.

No specific monitoring requirements have been identified for the operational phase of the Proposed Development, as no residual effects on fish, shellfish, or turtle receptors are anticipated.

12.9 SUMMARY

Chapter 12: Fish, Shellfish and Turtle Ecology has assessed the potential for cumulative, interactive, transboundary, and residual effects on fish, shellfish, and turtles arising from the Proposed Development. No significant cumulative effects are anticipated, due to the limited spatial and temporal extent of predicted pressures, the nature of the port environment, and the absence of sensitive biological features (e.g., spawning or nursery habitats) within the ZoI.

Interactions between construction activities and other pressures (e.g., underwater noise, suspended sediment) are expected to be highly localised and temporary. No transboundary effects are predicted, as the zone of impact does not extend beyond Irish territorial waters.

Following the implementation of integrated design measures, no significant residual effects are expected during either the construction or operational phases. Refer to Table 12.12.

Table 12.12: Assessment Summary

Potential Effect	Construction/ Operation	Beneficial /Adverse/ Neutral	Extent (Site/Local/National/ Transboundary)	Short term/ Long term	Direct/ Indirect	Permanent/ Temporary	Reversible/ Irreversible	Significance of Effect (according to defined criteria)	Proposed mitigation	Residual Effects (according to defined criteria)
Underwater noise (Piling, Dredging, Rock Blasting)	Construction	Adverse	Site	Short term	Direct	Temporary	Reversible	Not Significant	n/a	Not Significant
Temporary disturbance from Dredging	Construction	Adverse	Site	Short term	Direct/ Indirect	Temporary	Reversible	Not Significant	n/a	Not Significant
Permanent Habitat loss due to proposed land reclamation and presence of port foundations	Construction	Adverse	Site	Long term	Indirect	Permanent	Irreversible	Not Significant	n/a	Not Significant
Increased suspended sediment and sedimentation	Construction	Adverse	Local	Short term	Indirect	Temporary	Reversible	Not Significant	n/a	Not Significant
Habitat modification (Proposed port infrastructure)	Operation	Adverse	Site	Long term	Direct/ Indirect	Permanent	Irreversible	Not Significant	n/a	Not Significant

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