Appropriate Assessment Screening and Natura Impact Statement

Maritime Usage Licence Application for Marine Site Investigation Surveys at Port of Cork, Ringaskiddy, County Cork

Document Control

Project

Client

Document

Report Number:

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[1.1] Project Background

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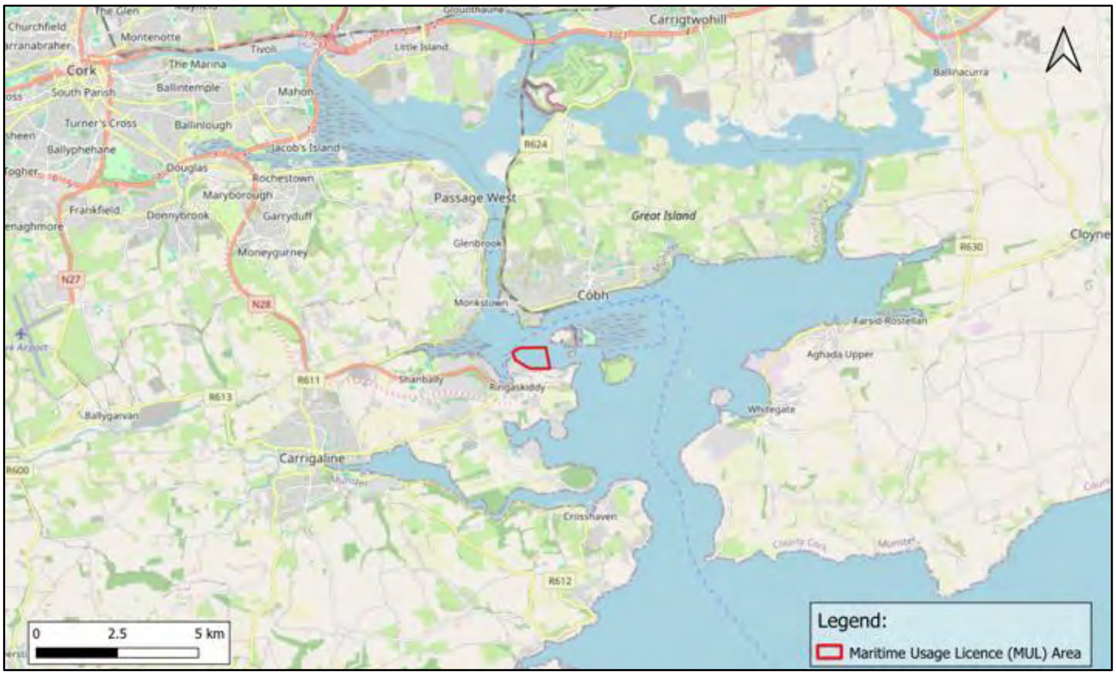


Figure 1-1. Map of Site Location.

Figure 1-2. Approximate location of the proposed MUL area

[1.3] Proposed Works

Crangon crangon *Carcinus maenas*

Carcinus maenas *Crangon crangon*

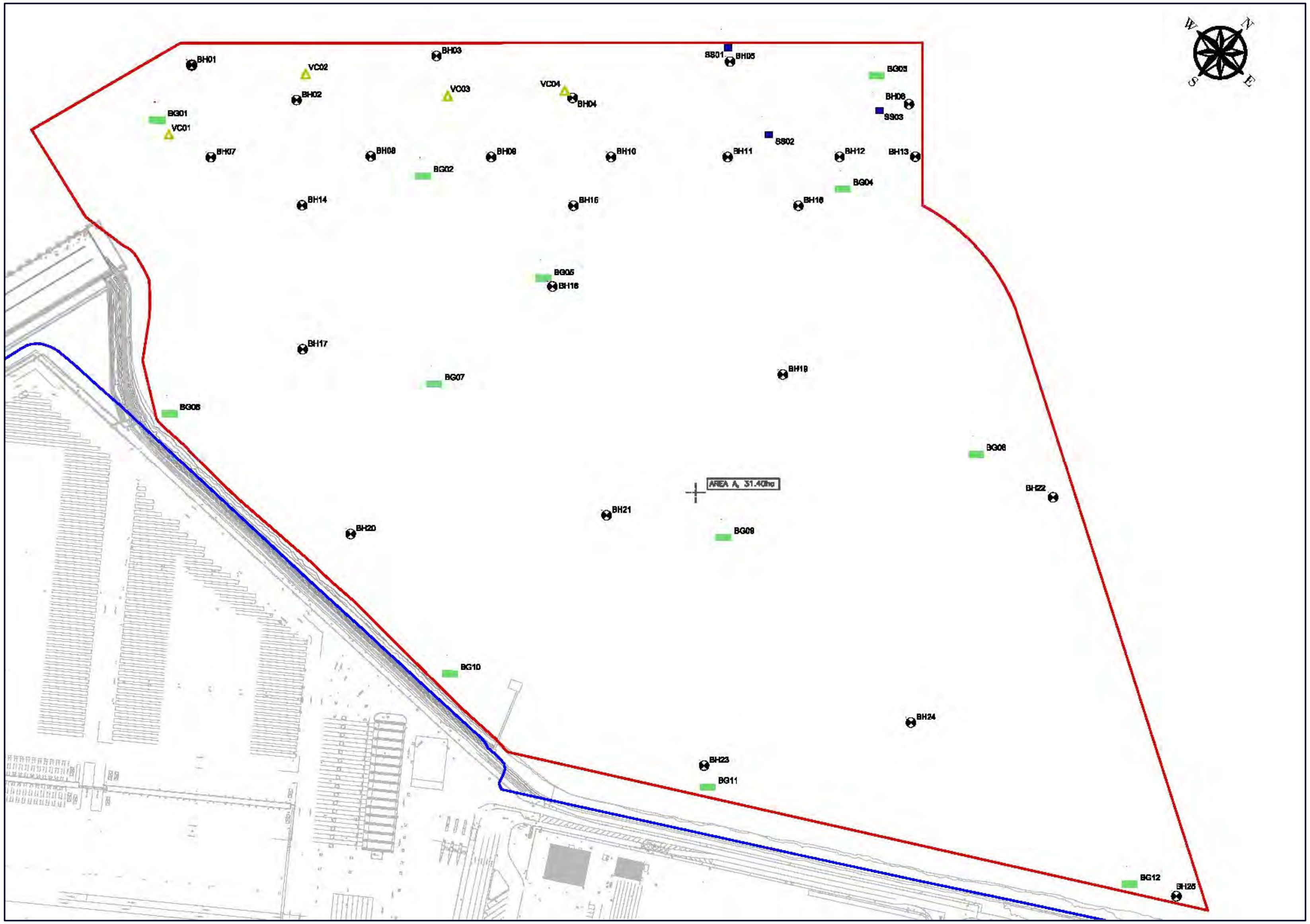


Figure 1-3. Map of survey requirements

[1.4] Preparation of Report

Table 1-1: Ayesa Team

Title	Name	Role	Qualifications	Years experience

[2] Appropriate Assessment Process

[2.1] Process

[2.2] Stage 1: AA Screening

[2.3] Legislative Background and Guidance Documents

"Any plan or project not directly connected with or necessary to the management of the [European] site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to appropriate assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."

"If, in spite of a negative assessment of the implications for the [European] site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, Member States shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 sites is protected. It shall inform the Commission of the compensatory measures adopted."

"A screening for Appropriate Assessment of a plan or project for which an application for consent is received, or which a public authority wishes to undertake or adopt, and which is not directly connected with or necessary to the management of the site as a European Site, shall be carried out by the public authority to assess, in view of best scientific knowledge and in view of the conservation objectives of the site, if that plan or project, individually or in combination with other plans or projects is likely to have a significant effect on the European site."

"The public authority shall determine that an Appropriate Assessment of a plan or project is not required where the plan or project is not directly connected with or necessary to the management of the site as a European Site and if it can be excluded on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site."

"(a)Where, in relation to a plan or project for which an application for consent has been received, a public authority decides that an Appropriate Assessment is required, the public authority shall give notice of the determination, including reasons for the determination of the public authority, to the following—

i. the applicant,

ii. if appropriate, any person who made submissions or observations in relation to the application to the public authority, or

iii. if appropriate, any party to an appeal or referral.

(b) Where a public authority has determined that an Appropriate Assessment is required in respect of a proposed development it may direct in the notice issued under subparagraph (a) that a Natura Impact Statement is required."

"Appropriate Assessment of Plans and Projects in Ireland – guidance for Planning Authorities, 2009" "Assessment of plans and projects significantly affecting Natura 2000 sites - Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC".

[3] Methods

[3.1] Desktop Information Consulted for this Report

[3.2] Cumulative and In-Combination Effects

[3.3] Screening Assessment of European Sites

Article 6(3) of Directive 92/43 must be interpreted as meaning that: in order to determine whether it is necessary to carry out an appropriate assessment of the implications of a plan or project for a site, ***account may be taken of the features of that plan or project which involve the removal of contaminants and which therefore may have the effect of reducing the harmful effects of the plan or project on that site, where those features have been incorporated into that plan or project as standard features****, inherent in such a plan or project, irrespective of any effect on the site".*

"The 'zone of influence' for a project is defined as "the area over which ecological features may be affected by biophysical changes because of the proposed project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries"

Larus fuscus

Phocena phocena

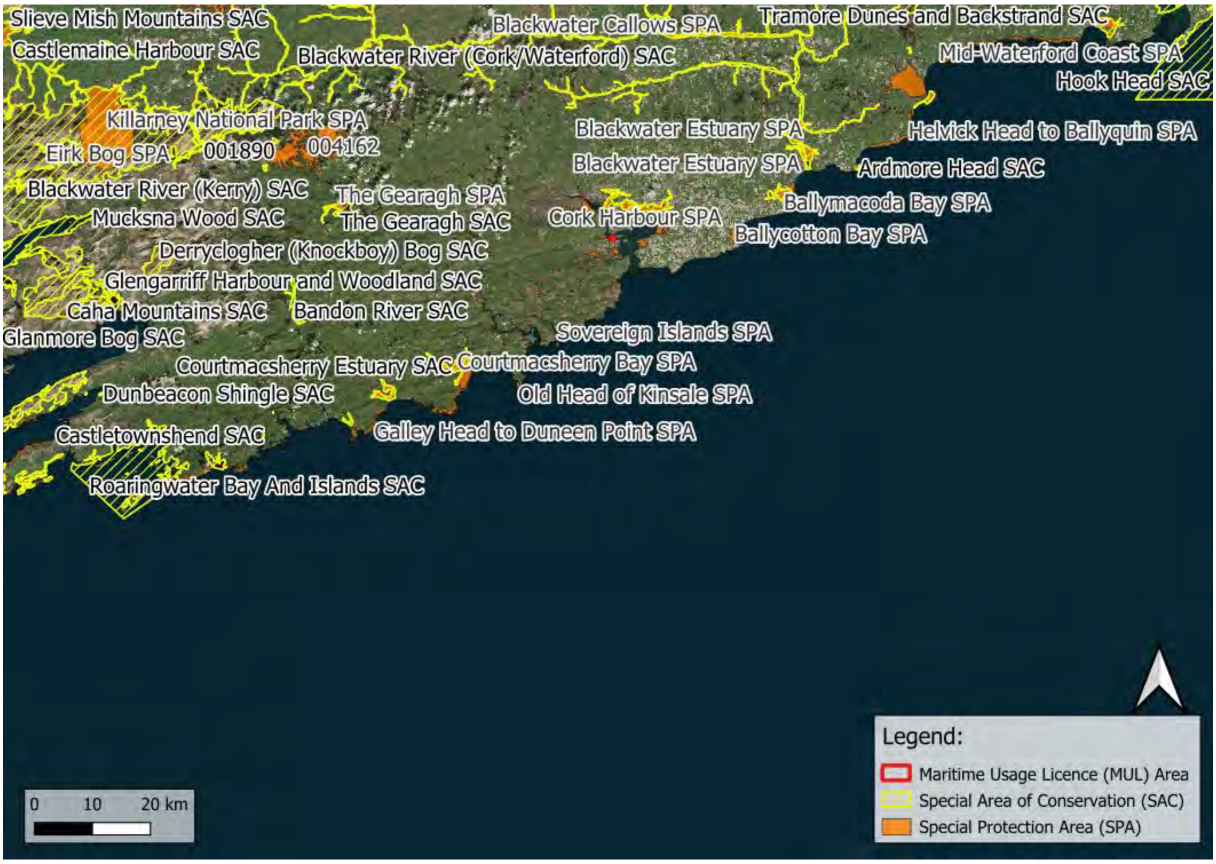


Figure 3-1. Natura 2000 Sites located along the south coast

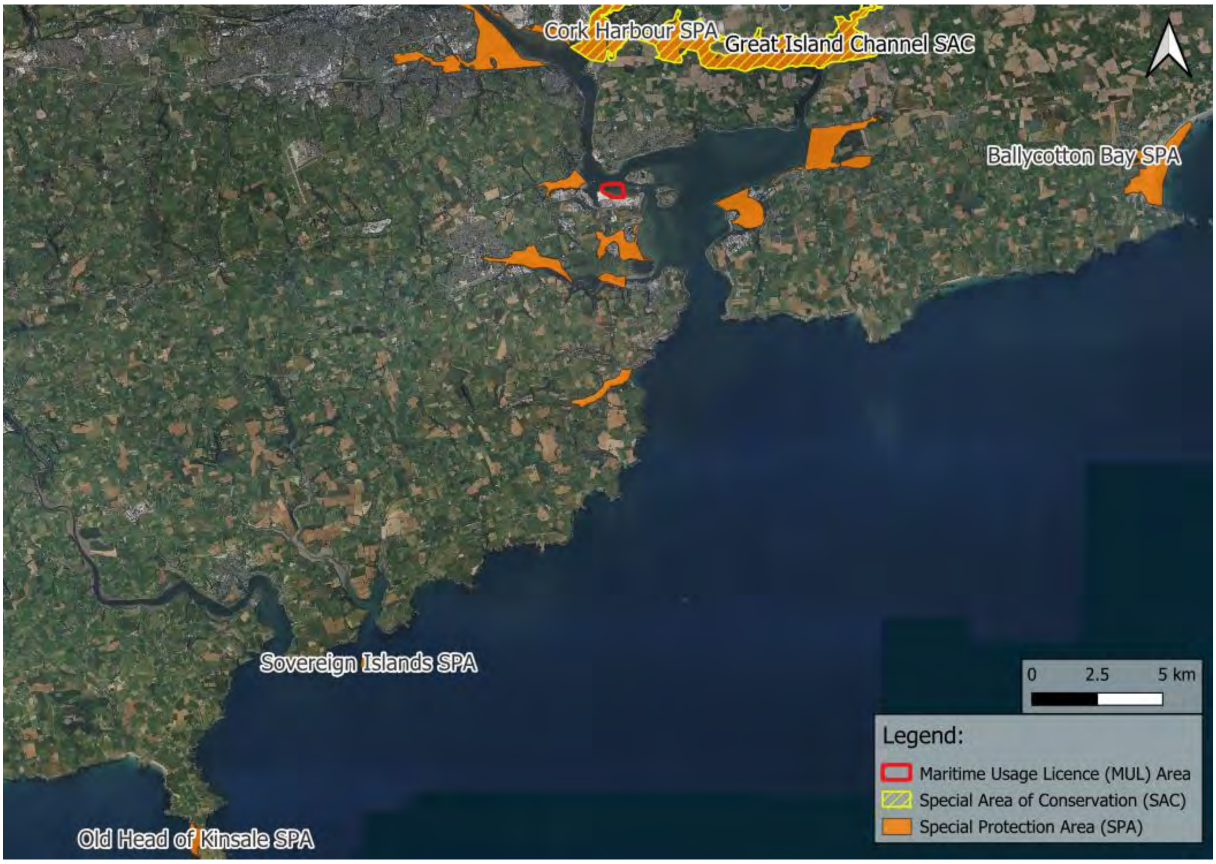


Figure 3-2. Natura 2000 Sites located nearest to the proposed site

[3.4] Source-Pathway-Receptor (SPR) Model

[3.5] Specialist Surveys

Ringaskiddy East (Container and Multi-purpose Berth (CB/MPB)):

Ringaskiddy West (Deepwater Berth Extension):

Road Improvements:

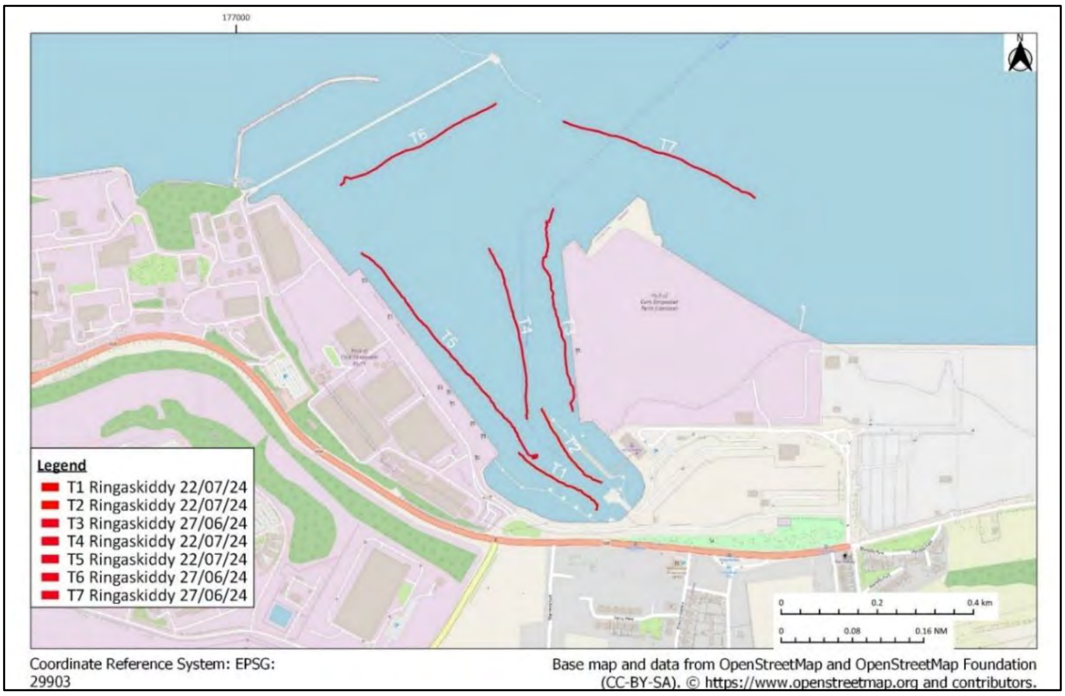
Denis Murphy

Figure 3-3. Ringaskiddy Subtidal and intertidal sampling locations July 2024.

Figure 3-4. Intertidal Transect 1 station locations.

Figure 3-5. Intertidal Transect 2 station locations.

Figure 3-6. Drop Down Video locations Ringaskiddy



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[3.6] Assessment of Likelihood of Significant Effects

[4] Results

[4.1] Marine Ecology

Transect 1

Xanthoria parietina, Caloplaca marina *Hydropunctaria maura* *Verrucaria maura*

Pelvetia canaliculata *Fucus spiralis* *Fucus spiralis* *Ascophylum nodosum* *Vertebrata lanosa* *Ulva* *Ascophyllum nodosum*

Mytilus edulis

Transect 2

Xanthoria parietina, Caloplaca marina *Hydropunctaria maura* *Verrucaria maura*

Pelvetia canaliculata *Fucus spiralis* *Fucus spiralis* *Ascophylum nodosum* *Vertebrata lanosa* *Ulva* *Ascophyllum nodosum*

Melinna palmata

Nephtys

Fucus spiralis

Ascophyllum nodosum

Mytilus edulis

Cerastoderma edule *Abra nitida*

Spisula subtruncata *Nephtys hombergii*

Melinna

palmata *Magelona* *Thyasira*

Pleuronectes platessa

Pomatoschistus minutus

Callionymus reticulatus *Solea solea*

Polybius depurator
Carcinus maenas *Crangon crangon*

Phoca vitulina

Halicheros grypus *Lutra lutra*

[4.2] Wintering and Breeding Birds

Table 4-1. Wintering Bird Survey Results – October 2023

Species	October 2023 - Wintering					

Table 4-2. Wintering Bird Survey Results – November 2023

Species	November 2023 - Wintering					

Table 4-3. Wintering Bird Survey Results – December 2023

Species	December 2023 - Wintering					

Table 4-4. Wintering Bird Survey Results – January 2024

Species	January 2024 - Wintering					

Table 4-5. Wintering Bird Survey Results – February 2024

Species	February 2024 - Wintering					

Table 4-6. Wintering Bird Survey Results – February 2024

Species	March 2024 - Wintering					

Table 4-7. Breeding Bird Survey Results – May 2024

Species	May 2024 - Breeding							

Table 4-8. Breeding Bird Survey Results – June 2024

Species	June 2024 - Breeding							

Table 4-9. Breeding Bird Survey Results – July 2024

Species	July 2024 - Breeding							

Table 4-10. Breeding Bird Survey Results – August 2024

Species	August 2024 - Breeding							
Bar tailed Godwit								
Black Guillemot								
Black-headed Gull								
Black-tailed Godwit				8 F		4 F		
Brent Goose								
Common Gull								
Common Tern						6 F	1 F	
Cormorant	2 F	16 R	3 F	3 F	148 R	43 R	2 R	17 R
Curlew	1 R	1 F		6 F		7 F		5 F
Dunlin								
Great Black-backed Gull								
Great Crested Grebe								
Greenshank	4 R					7 F	1 F	
Grey Heron	1 R	6 F	1 R	5 F	2 R	5 R		3 F
Herring Gull								
Lapwing								
Lesser Black-backed Gull								
Little Egret	1 R			1 F	7 R			
Mallard	14 R	2 F			19 R	4 F		
Mediterranean Gull								
Mute Swan								
Oystercatcher	25 R	29 F		42 F	2 R	4 F	1 M	27 F
Red-breasted Merganser								
Redshank						51 F		
Sandwich Tern		1 M				2 F	3 F	
Shag	1 F	2 F		2 R		3 R	4 R	3 F
Shelduck								
Snipe								
Teal								
Turnstone								
Whimbrel							1 F	
Other								
Gannet			1 M					
Ringed Plover				33 F				

[5] Screening of likely impacts

[5.1] Sources of Likely Significant Effects

[5.2] Pathways

[5.3] Receptors

[6] Screening of Likely Significant Effects to European Sites

Table 6-1. Likelihood of significant effects to the SCIs of Cork Harbour SPA

Special Conservation Interests [004030]	Comments	Screening Determination
Tachybaptus ruficollis		Screened In
Podiceps cristatus		Screened In
Phalacrocorax carbo		Screened In
Ardea cinerea		Screened In
Tadorna tadorna		Screened In
Anas penelope		Screened In

Special Conservation Interests [004030]	Comments	Screening Determination
Anas crecca		Screened In
Anas acuta		Screened In
Anas clypeata		Screened In
Mergus serrator		Screened In
Haematopus ostralegus)		Screened In
Pluvialis apricaria		Screened In

Special Conservation Interests [004030]	Comments	Screening Determination
Pluvialis squatarola		Screened In
Vanellus vanellus		Screened In
Calidris alpina		Screened In
Limosa limosa)		Screened In
Numenius arquata		Screened In
Tringa totanus		Screened In
Chroicocephalus		Screened In

Special Conservation Interests [004030]	Comments	Screening Determination
ridibundus		
Larus canus		Screened In
Larus fuscus		Screened In
Sterna hirundo		Screened In
		Screened In

Table 6-2. Likelihood of significant effects to the QIs of Ballycotton Bay SPA

Special Conservation Interests [004022]	Comments	Significant Effect Likely
Anas crecca		Screened Out
Charadrius hiaticula		Screened Out
Pluvialis apricaria		Screened Out

Special Conservation Interests [004022]	Comments	Significant Effect Likely
Pluvialis squatarola		Screened Out
Vanellus vanellus		Screened Out
Limosa limosa		Screened In
Limosa lapponica		Screened In
Numenius arquata		Screened In

Special Conservation Interests [004022]	Comments	Significant Effect Likely
Arenaria interpres		Screened In
Larus canus	*et al*	Screened In
Larus fuscus	*et al.,*	Screened In
		Screened Out

Table 6-3. Likelihood of significant effects to the QIs of Sovereign Islands SPA

Special Conservation Interests [004124]	Comments	Significant Effect Likely
Phalacrocorax carbo		Screened In

Table 6-4. Likelihood of significant effects to the QIs of Ballymacoda Bay SPA

Special Conservation Interests [004023]	Comments	Screening Determination
Calidris alba		Screened Out
Arenaria interpres		Screened Out
Anas penelope		Screened Out
Anas crecca		Screened Out
Pluvialis apricaria		Screened Out
Pluvialis squatarola		Screened Out
Charadrius hiaticula		Screened Out
Vanellus vanellus		Screened Out
Calidris alpina		Screened Out
Limosa limosa)		Screened Out

Special Conservation Interests [004023]	Comments	Screening Determination
Numenius arquata		Screened Out
Tringa totanus		Screened Out
Chroicocephalus ridibundus		Screened Out
		Screened Out
Larus canus	*et al*	Screened In
Larus fuscus	*et al.,*	Screened In

Table 6-5. Likelihood of significant effects to the QIs of Old Head of Kinsale SPA

Special Conservation Interests [004121]	Comments	Significant Effect Likely
Rissa tridactyla		Screened In
Uria aalge		Screened Out

Table 6-6. Likelihood of significant effects to the QIs of Courtmacsherry Bay SPA

Special Conservation Interests [004219]	Comments	Screening Determination
Gavia immer		Screened Out
Tadorna tadorna		Screened Out
Anas penelope		Screened Out
Mergus serrator		Screened Out
Pluvialis apricaria		Screened Out
Vanellus vanellus		Screened Out

Special Conservation Interests [004219]	Comments	Screening Determination
Calidris alpina		Screened Out
Limosa limosa)		Screened Out
Limosa lapponica		Screened Out
Numenius arquata		Screened Out
Chroicocephalus ridibundus		Screened Out
		Screened Out
Larus canus	*et al*	Screened In

Table 6-7. Likelihood of significant effects to the QIs of Great Island Channel SAC

Qualifying Interests [001058]	Comments	Screening Determination
Habitats		
Mudflats and sandflats not covered by seawater at low tide [1140]	An influx of sediment from the project site could negatively alter the condition of these mudflats and sandflats. Contamination by petrochemicals or heavy sedimentation may cause morbidity or mortality of polychaete/oligochaete community complex, the sustenance of which is identified as a conservation objective of the SAC.	Screened In
Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]	Contamination by oils or petrochemicals may lead to plant morbidity or death and thus the vegetation structure and composition may be negatively affected. Increased sediment deposition may lead to an increase in the area available for colonisation by saltmarsh vegetation.	Screened In

Table 6-8. Likelihood of significant effects to the QIs of Hook Head SAC

Qualifying Interests [000764]	Comments	Screening Determination
Large shallow inlets and bays [1160]	Too far removed from the project site to be impacted on by hydrocarbons, sedimentation or noise impacts.	Screened Out
Reefs [1170]	Too far removed from the project site to be impacted on by hydrocarbons, sedimentation or noise impacts.	Screened Out
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	Too far removed from the project site to be impacted on by hydrocarbons, sedimentation or noise impacts.	Screened Out

Qualifying Interests [000764]	Comments	Screening Determination
Tursiops truncatus (Common Bottlenose Dolphin) [1349]	A bottlenose dolphin would likely travel from the Hook Head SAC to Cork Harbour to forage, as both are part of a broader network of habitats used by transient dolphins in Ireland. Cork Harbour is an established, albeit occasional, foraging and transit area for bottlenose dolphins, particularly mother/calf pairs, and the journey between the two areas for feeding is plausible. Bottlenose dolphins do not have a fixed foraging distance, as it depends on factors like prey availability and water depth, and can range from very small areas to traveling up to 100 km (62 miles) a day. They search for prey in specific, smaller "hotspots," such as areas where prey is concentrated by currents, or near human activity, and can be found both inshore and offshore (Moreno and Mathews, 2018). Underwater noise impacts from survey activities may impact these species in the area.	Screened In
Phocoena phocoena (Harbour Porpoise) [1351]	A harbour porpoise would likely travel from the Hook Head SAC to Cork Harbour to forage, as they undertake seasonal movements related to food availability and are commonly found in coastal waters. These movements can include inshore travel in the summer to feed, and they may move north or south depending on prey distribution. Harbour porpoises have varied foraging distances, moving between approximately 14 and 59 km per day on average, with some individuals traveling much farther. Their movements can range from daily travel in the tens of kilometers to long-distance migrations of over 1,000 km. Their foraging is influenced by local food availability, with some staying within smaller core areas while others cover vast distances. Underwater noise impacts from survey activities may impact these species in the area.	Screened In

Table 6-9. Likelihood of significant effects to the QIs of Roaringwater Bay and Islands SAC

Qualifying Interests [000101]	Comments	Significant Effect Likely
Large shallow inlets and bays [1160]	Too far removed from the project site to be impacted on by hydrocarbons, sedimentation or noise impacts.	Screened Out
Reefs [1170]	Too far removed from the project site to be impacted on by hydrocarbons, sedimentation or noise impacts.	Screened Out
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	Too far removed from the project site to be impacted on by hydrocarbons, sedimentation or noise impacts.	Screened Out
European dry heaths [4030]	Too far removed from the project site to be impacted on by hydrocarbons, sedimentation or noise impacts.	Screened Out
Submerged or partially submerged sea caves [8330]	Too far removed from the project site to be impacted on by hydrocarbons, sedimentation or noise impacts.	Screened Out
Phocoena phocoena (Harbour Porpoise) [1351]	A harbour porpoise would likely travel from the Roaringwater Bay and Islands SAC to Cork Harbour to forage, as they undertake seasonal movements related to food availability and are commonly found in coastal waters. These movements can include inshore travel in the summer to feed, and they may move north or south depending on prey distribution. Underwater noise impacts from survey activities may impact these species in the area.	Screened In
Lutra lutra (Otter) [1355]	It is unlikely an otter would intentionally venture 100km from a Special Area of Conservation (SAC) in Ireland, as typical home ranges are much smaller. An otter's territory, even for males which have larger ranges, is a matter of kilometers, not tens of kilometers.	Screened Out
Halichoerus grypus (Grey Seal) [1364]	Grey seal screened out due to foraging range c.30km from haul-out site (Vincent et al. 2016), and tolerance to anthropogenic noise and activity (Anderwald et al. 2013)	Screened Out

[6.2] Cumulative and In-Combination Significant Effects

Table 6-10. Review of planning applications within 2 km of the development

Application Number	Description	Potential for In-Combination

[7] Screening Statement

"The public authority shall determine that an Appropriate Assessment of a plan or project is not required […] if it can be excluded on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site."

"The public authority shall determine that an Appropriate Assessment of a plan or project is not required […] if it can be excluded on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site."

Chapter B – Natura Impact Assessment (NIS)

[8] Introduction

[8.1] Methodology for Stage 2: Appropriate Assessment (NIS)

[9] Appropriate Assessment of Screened In Natura 2000 Sites

Tursiops truncatus

Phocoena phocoena

Phocoena phocoena

[9.1] Conservation Objectives of Screened in QIs/SCIs of Natura 2000 Sites

1) Cork Harbour SPA (NPWS, 2014a)

2) Great Island Channel SAC (NPWS, 2014b)

3) **Ballycotton Bay SPA (NPWS, 2014c)**

4) **Sovereign Islands SPA (NPWS, 2025a)**

Phalacrocorax carbo

5) **Ballymacoda Bay SPA (NPWS, 2015)**

Larus canus *Larus fuscus*

Larus canus

Larus fuscus

6) **Old Head of Kinsale SPA (NPWS, 2025b)**

Rissa tridactyla

Uria aalge

7) **Courtmacsherry Bay SPA (NPWS, 2014d)**

The *(Larus canus)*

Larus canus

8) **Hook Head SAC (NPWS, 2025c)**

Tursiops truncatus *Phocoena phocoena*

9) **Roaringwater Bay and Islands SAC (NPWS, 2011)**

Phocoena phocoena

[9.2] Assessment of Potential Significant Effects

et al

Sterna Hirundo

Phocoena phocoena *Tursiops truncatus*

Phocoena phocoena *Tursiops truncatus*

[9.3] Mitigation Measures

Table 9-1. Proposed mitigation measures

Receptor	Potential Effects	Mitigation Measures

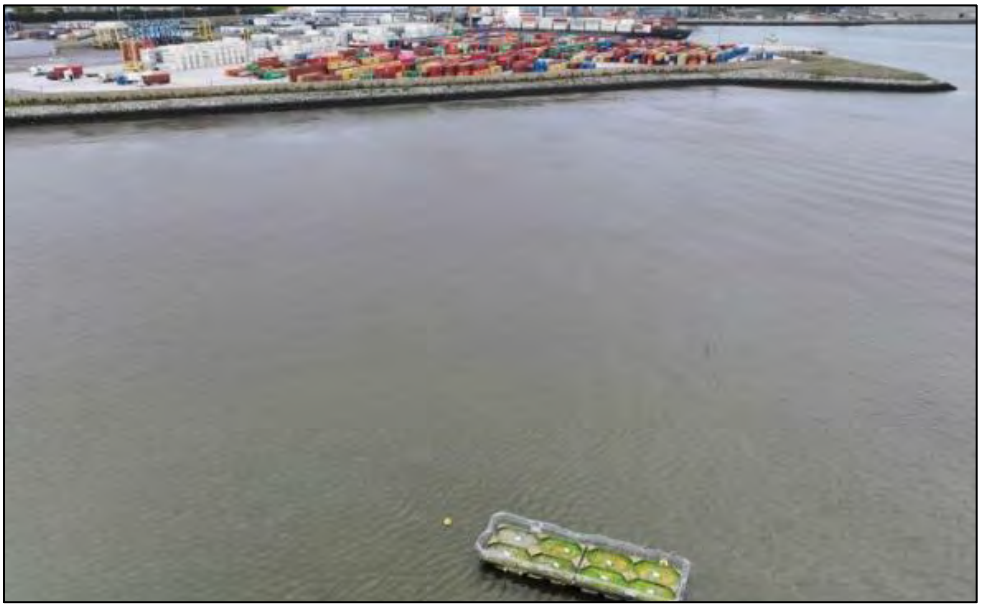


Figure 9-1. A pontoon for terns in Cork Harbour opposite the Cork Container Terminal at the Port of Cork.

[9.4] Residual Impacts

[10] Conclusion

References

Vanellus vanellus

Anas crecca

Halichoerus grypus

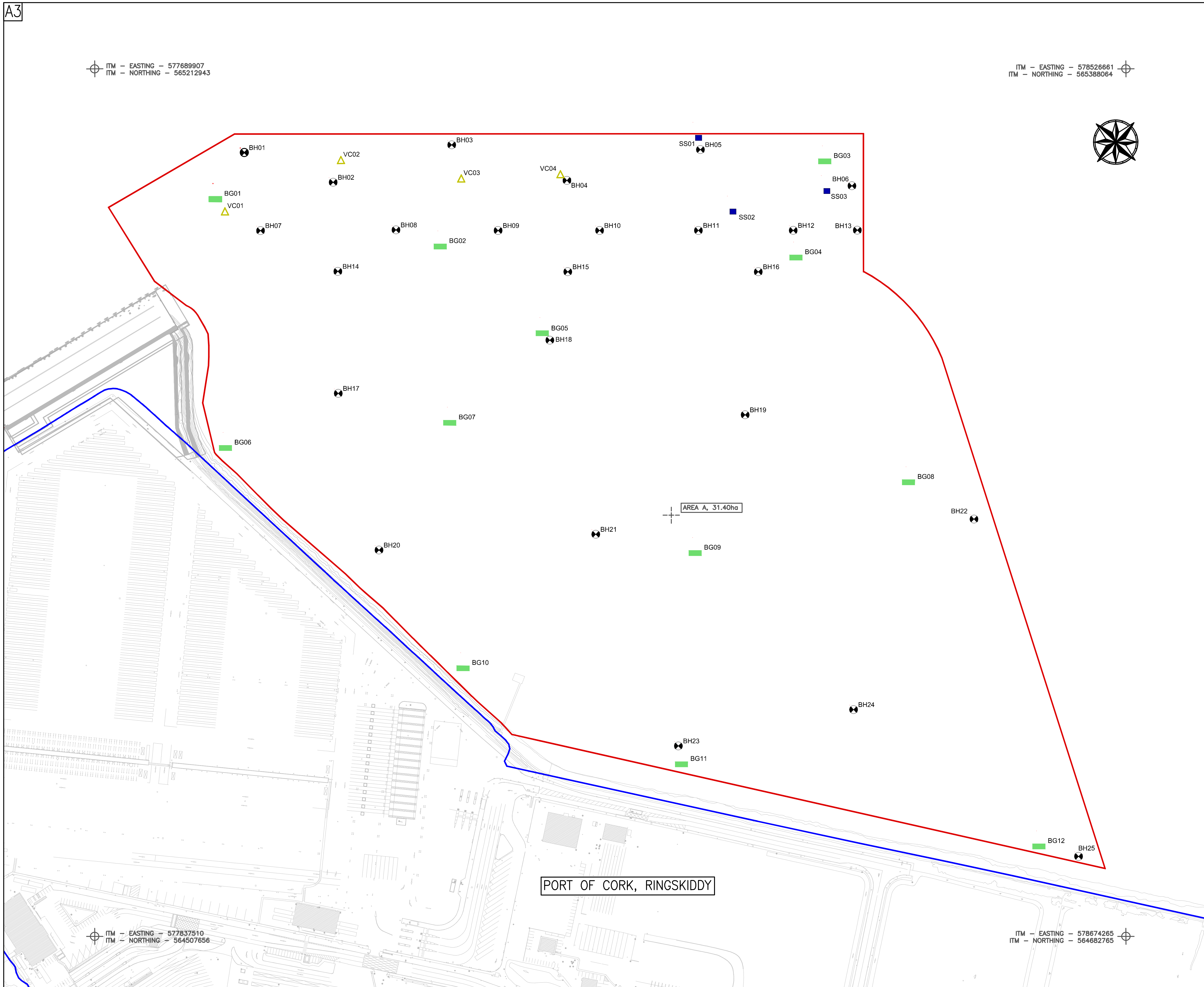
Foreshore Licence / Maritime Usage Licence Application for Marine Site Investigation Surveys at Dognose Bank, Corkbeg, Whitegate, Co. Cork.

Uria aalge

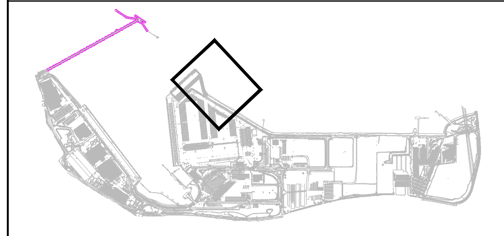
Noise Impact Assessment on Wintering Birds

Appendix A – Proposed Sampling Plan

A3



KEY PLAN



SAFETY, HEALTH AND ENVIRONMENTAL

REFER TO THE PROJECT DESIGN RISK REGISTER FOR ALL SAFETY, HEALTH AND ENVIRONMENTAL RISK, INCLUDING CONSTRUCTION, MAINTENANCE AND DEMOLITION.

GENERAL NOTES

1. DO NOT SCALE OFF DRAWING.
2. ALL DIMENSIONS IN MILLIMETRES (mm) UNLESS OTHERWISE NOTED.
3. ALL LEVELS ARE IN METRES (m) AND TO CHART DATUM (CD) UNLESS OTHERWISE NOTED.
4. ALL CO-ORDINATES ARE GIVEN IN METRES AND ARE TO IRISH MERCATOR GRID CO-ORDINATES. IRISH TRANSVERSE MERCATOR (ITM) USED AS MAP PROJECTION.
5. BATHYMETRIC SURVEY SHOWN BY IRISH HYDRODATA DRAWING NO. 1364-S5-RB-1124 (NOVEMBER 2024) AND HYDROMASTER PORT OF CORK MONITORING SURVEY SECTION 3, CHART 1 (MARCH 2025)
7. ALL SITE INVESTIGATION LOCATIONS ARE INDICATIVELY SHOWN AND WILL BE CONFIRMED ONCE THE APPOINTED CONTRACTOR IS ON SITE.
8. DROP DOWN VIDEO (DDV) SURVEYS OF ALL SUBTIDAL BENTHIC GRAB SAMPLES TO BE CONDUCTED BEFORE SAMPLING. TEN ADDITIONAL DDV TRANSECTS ARE TO BE CONDUCTED IN POTENTIAL REEF AREAS.
9. FIVE BEAM TRAWLS WILL BE SPREAD OUT WITHIN THE SITE BOUNDARY.

LEGEND:

- HIGH WATER MARK LINE
- PROPOSED MUL BOUNDARY
- BENTHIC GRAB LOCATION
- SEDIMENT SAMPLING GRAB LOCATION
- BOREHOLE LOCATION
- VIBROCORE LOCATION

REV	DATE	DESCRIPTION	CHK	APP
P03	19.12.25	FINAL	DM	AA
P02	18.12.25	ISSUE FOR REVIEW	DM	AA
P01	08.12.25	ISSUE FOR REVIEW	POC	AA

CLIENT

PORT of CORK

ENGINEER

ayesa

PROJECT

PORT OF CORK EXPANSION WORKS

DRAWING TITLE

PROPOSED MUL MAP 3

STATUS: FINAL

SUITABILITY: S3

Date: 18.12.25	Scale: 1:3000	Drawn: JN	Chk: DM	App: AA

Project No:	Drg. No:	Rev:
1179	CORE2-AYE-RE-XX-DR-MA-0003	P02

Appendix B – Ringaskiddy Wintering and Breeding Wetland Bird Survey Report (Flynn Furney, 2024)

FLYNN FURNEY

ENVIRONMENTAL CONSULTANTS

Port of Cork Bird Surveys 2023/2024

Ringaskiddy Wintering & Breeding Wetland Bird Survey Report.

Document Details

Client: Port of Cork Company
Scheme Name: Port of Cork Bird Surveys
Document Title: 2023/2024 Ringaskiddy Wintering and Breeding Wetland Bird Survey Report
Prepared by: Jack Coffey

Flynn Furney Environmental Consultants

Rev	Status	Date	Author(s)	Approved by

1. INTRODUCTION

1.1 Cork Harbour SPA

Table 1: Cork Harbour SPA [IE0004030] SCIs

Cork Harbour SPA SCIs.		**Season**	**Qualifying Population**[1]
	Tachybaptus ruficollis		
	Podiceps cristatus		
	Phalacrocorax carbo		
	Ardea cinerea		
	Tadorna tadorna		
	Anas Penelope		
	Anas crecca		
	Anas acuta		
	Anas cylpeata		

	Mergus serrator		
	Haematopus ostralegus		
	Pluvialis apricaria		
	Pluvialis squatarola		
	Vanellus vanellusi)		
	Calidris alpina		
	Limosa limosa		
	Limosa lapponica		
	Numenius arquata		
	Tringa tetanus		
	Larus ridibundus		
	Larus canus		
	Larus fuscus		
	Sterna hirundo		

nationally important *Tachybaptus ruficollis* *Podiceps cristatus* *Phalacrocorax carbo* *Ardea cinerea* *Tadorna tadorna* *Anas penelops* *Anas crecca* *Anas acuta* *Anas clypeata* *Mergus serrator* *Haematopus* *Pluvialis apricaria* *Pluvialis squatarola* *Vanellus vanellus* *Calidris alpina* *Limosa laponica* *Numenius Arquata* *Larus ridibundus* *Larus canus* *Larus fuscus* **nationally important** *Sterna hirundo*

2. METHODOLOGY

Figure 1, Appendix 1

2.1 Survey Timeline

Table 2: Survey dates, tide times and count areas included for each survey.

Survey	Date	Tide Time	Count Areas Surveyed

3. RESULTS

Species	October 2023 - Wintering					
Bar tailed Godwit						
Black Guillemot						
Black-headed Gull	72 R	39 R	37 R	16 R		46 R
Black-tailed Godwit					41 R	
Brent Goose						
Common Gull	4 R	5 R	5 R	2 R		3 R
Common Tern						
Cormorant	43 R	29 R	12 R	7 R	334 R	65 R
Curlew		2 F		4 R	1 F	31 F
Dunlin				25 F		
Great Black-backed Gull	8 R	4 R	1 R	5 R	1 R	1 R
Great Crested Grebe					1R	
Greenshank	1 R	1 F		3 F	9 R	3 F
Grey Heron	2 R	7 F	2 R	5 F	17 R	30 R
Herring Gull	13 R	28 R	3 R	11 R	5 R	3 R
Lapwing						
Lesser Black-backed Gull	1 R	8 R			5 R	3 R
Little Egret	1 F	2 F	1 F	1 F	6 R	4 F
Mallard	4 R	28 R			17 R	5 R
Mediterranean Gull						1 R
Mute Swan	1 R	7 R		1 R	1 R	
Oystercatcher		8 F	1 F	19 F	7R	7 F
Red-breasted Merganser						
Redshank	2 F	2 F		3 F	5 F	68 F
Sandwich Tern						
Shag	2 R	2 R	6 R	8 R		
Shelduck						
Snipe						
Teal					23 R	53 R
Turnstone	3 F			4 F	2 F	
Whimbrel						
Other						
Common Sandpiper	1 R	1 F	1 F			
Ringed Plover				20 F		

Species	November 2023 - Wintering					
Bar tailed Godwit						
Black Guillemot			1 F			
Black-headed Gull	92 R	126 R	8 R	19 F	28 R	41 F
Black-tailed Godwit					5 R	33 F
Brent Goose						
Common Gull		2 R		3 F	2 R	
Common Tern						
Cormorant	85 R	19 R	1 F	6 F	91 R	15 R
Curlew	1 R	2 F		3 F	12 R	21 F
Dunlin	9 R					97 F
Great Black-backed Gull	5 R	1 R	2 R	3 F	2 R	
Great Crested Grebe					1 F	1 F
Greenshank	2 R	1 R		2 F	2 F	4 F
Grey Heron	2 F	7 R	1 R	6 F	5 R	9 F
Herring Gull	1 R	8 F		9 F	3 R	
Lapwing						5 R
Lesser Black-backed Gull	1 R	2 R			2 R	1 R
Little Egret	1 R					3 F
Mallard	8 R	46 R			67 R	5 R
Mediterranean Gull						
Mute Swan	7 R	6 R	2 R			
Oystercatcher		7 F		29 F	14 R	12 F
Red-breasted Merganser				2 R		
Redshank	17 R	4 F		5 F	3 F	57 F
Sandwich Tern						
Shag		1 R	6 R	2 R	2 R	
Shelduck	1 R				7 R	15 F
Snipe	8 R			2 F		5 F
Teal					56 R	78 R
Turnstone					11 F	
Whimbrel						
Common Sandpiper	1 R	1 R	1 R	2 F		
Ringed Plover				1 F		
Great Northern Diver					1 F	

Wigeon					1 F	

Species	December 2023 - Wintering					
Bar tailed Godwit						2 F
Black Guillemot						
Black-headed Gull	193 R	258 F	1 R	2 R	17 R	119 F
Black-tailed Godwit		20 F			58 R	38 F
Brent Goose		19 F		9 F	5 F	
Common Gull					1 R	3 F
Common Tern						
Cormorant	2 R	62 R	2 F	3 F	169 R	31 R
Curlew		2 F		1 F	8 F	13 F
Dunlin						56 F
Great Black-backed Gull	5 R	2 R	2 R	2 R	1 R	3 R
Great Crested Grebe						
Greenshank		1 F	1 F	1 R	4 F	2 F
Grey Heron		5 F	1 R	4 R	21 R	7 F
Herring Gull	36 R	26 F		15 R	4 R	6 F
Lapwing						
Lesser Black-backed Gull	2 R	2 R		1 R	2 R	3 F
Little Egret			1 R	1 F	1 F	
Mallard	3 R	67 R			79 R	23 R
Mediterranean Gull						
Mute Swan	6 R	5 R	2 F	2 R		
Oystercatcher		7 F	1 F	3 F	2 F	8 R
Red-breasted Merganser					3 F	1 R
Redshank		2 F			2 F	64 F
Sandwich Tern						
Shag	1 F	1 R	1 F	5 R	6 R	
Shelduck	3 R	3 F			17 R	15 F
Snipe						
Teal		1 R			91 R	63 F
Turnstone					7 F	
Whimbrel						
Other						

Species	January 2024 - Wintering					
Bar tailed Godwit						
Black Guillemot			3 F		2 F	
Black-headed Gull	197 R	322 R	1 R	36 R	67 R	24 F
Black-tailed Godwit		35 F				112 F
Brent Goose						
Common Gull		28 R	1 R	67 F		26 R
Common Tern						
Cormorant	5 F	29 F	2 F	2 F	426 R	37 R
Curlew		3 F		4 F	6 F	13 F
Dunlin						23 F
Great Black-backed Gull	3 R	5 R	2 R	4 R	2 R	2 R
Great Crested Grebe						
Greenshank	3 R	2 F	1 F	2 F	3 F	2 F
Grey Heron	2 R	5 F		5 F	11 R	17 R
Herring Gull	41 R	53 R	4 R	24 F	2 R	9 F
Lapwing						
Lesser Black-backed Gull	4 R	6 R		2 R	3 F	4 R
Little Egret		2 F			1 F	1 F
Mallard	2 R	87 R			29 F	6 F
Mediterranean Gull		2 R				
Mute Swan		4 R				
Oystercatcher		7 F		29 F		3 F
Red-breasted Merganser						
Redshank	1 R	3 F		2 F	7 F	62 F
Sandwich Tern						
Shag			2 F	2 F		
Shelduck		10 F			26 F	27 F
Snipe						
Teal					53 F	109 F
Turnstone					6 F	5 F
Whimbrel						
Other						
Great Northern Diver			1 F			
Common Sandpiper				1 F		

Species	February 2024 - Wintering					
Bar tailed Godwit						4 F
Black Guillemot						
Black-headed Gull	243 R	82 R	9 R	5 R	49 R	139 R
Black-tailed Godwit					27 R	127 F
Brent Goose		34 F				
Common Gull	61 R	29 R	2 R	13 R	1 R	102 R
Common Tern						
Cormorant	109 R	86 R	4 F	3 F	407 R	11 R
Curlew		4 F		2 F	8 R	16 F
Dunlin						
Great Black-backed Gull	4 R	3 R	3 R	1 R	5 R	
Great Crested Grebe						
Greenshank		1 F	1 F		3 F	5 F
Grey Heron	2 R	4 R			23 R	8 R
Herring Gull	51 R	23 R	3 R	11 R	39 R	9 R
Lapwing				12 R		
Lesser Black-backed Gull	18 R	5 R	1 R		2 R	5 F
Little Egret						
Mallard	3 R	19 R			38 R	6 F
Mediterranean Gull	1 R				1 R	
Mute Swan	2 F	3 F				1 F
Oystercatcher		2 F	3 R	3 F		2 F
Red-breasted Merganser						
Redshank		1 F	5 F		3 F	64 F
Sandwich Tern						
Shag	1 R		1 R	4 R		
Shelduck					12 R	12 F
Snipe						
Teal					98 R	144 F
Turnstone						2 F
Whimbrel	1 F					
Other						
Common Sandpiper	1 R			1 R		
Ringed Plover						

Species	March 2024 - Wintering					
Bar tailed Godwit						
Black Guillemot						
Black-headed Gull	1 R	1 F				7 F
Black-tailed Godwit		26 F			97 R	550+ F
Brent Goose	2 R				2 F	
Common Gull	41 R	7 F				19 F
Common Tern						
Cormorant	2 F	3 F	1 F		69 R	13 R
Curlew		2 F				8 F
Dunlin						
Great Black-backed Gull	3 R		2 R			2 R
Great Crested Grebe						
Greenshank					1 R	5 F
Grey Heron	2 R	3 F	1 R		6 R	8 R
Herring Gull	5 R	12 F			2 R	
Lapwing						
Lesser Black-backed Gull		1 F				1 R
Little Egret					2 R	
Mallard	19 R	13 R			7 R	
Mediterranean Gull						
Mute Swan						
Oystercatcher		5 F				6 F
Red-breasted Merganser						
Redshank						31 F
Sandwich Tern						
Shag	2 R		1 R			
Shelduck		1 F			5 R	2 R
Snipe						
Teal					13 R	9 R
Turnstone						
Whimbrel						
Other						
Common Sandpiper	1 R	1 R				
Sandwich Tern	1 R					

Species	May 2024 - Breeding							
Bar tailed Godwit								
Black Guillemot							2 F	
Black-headed Gull								
Black-tailed Godwit								
Brent Goose								
Common Gull								
Common Tern	16 R	19 R	4 F	5 F	5 F	12 F	5 F	3 F
Cormorant	10 R	3 R	2 F	1 F	2 F	9 R	2 F	
Curlew								
Dunlin								
Great Black-backed Gull								
Great Crested Grebe								
Greenshank								
Grey Heron	1 R	5 F	1 R	2 F	1 R	3 F	1 R	1 R
Herring Gull								
Lapwing								
Lesser Black-backed Gull								
Little Egret						1 F		
Mallard	4 R	29 R	2 F	2 F	11 R	2 R		3 F
Mediterranean Gull								
Mute Swan		1 R						
Oystercatcher		2 F	4 M			8 F	4 R	4 R
Red-breasted Merganser								
Redshank								
Sandwich Tern								
Shag				1 R	1 R	2 R	1 F	
Shelduck					2 R	5 F		
Snipe								
Teal								
Turnstone								
Whimbrel								
Other								
Ringed Plover				2 F			3 F	

Species	June 2024 - Breeding							
Bar tailed Godwit								
Black Guillemot								
Black-headed Gull								
Black-tailed Godwit								
Brent Goose								
Common Gull								
Common Tern	15 F	13 F	3 F	8 F	6 F	11 F	2 F	5 F
Cormorant	5 R	9 R	1 F	2 F	7 R	13 R	10 R	6 R
Curlew					5 F	12 F	2 M	1 F
Dunlin								
Great Black-backed Gull								
Great Crested Grebe								
Greenshank						4 F	1 R	
Grey Heron	2 R	2 F	1 R	2 F	11 R	9 F		2 F
Herring Gull								
Lapwing								
Lesser Black-backed Gull								
Little Egret					1 F	1 F		
Mallard		1 R			9 R			
Mediterranean Gull								
Mute Swan	3 F	1 R	6 R		2 F			
Oystercatcher		3 F		4 F		7 F	7 R	2 F
Red-breasted Merganser								
Redshank								
Sandwich Tern								
Shag			2 R	3 R			1 R	
Shelduck					7 R	7 F	2 R	
Snipe								
Teal								
Turnstone				2 F				
Whimbrel								
Other								
Ringed Plover				2 F				
Sandwich Tern						1 R		

Species	July 2024 - Breeding							
Bar tailed Godwit								
Black Guillemot								
Black-headed Gull								
Black-tailed Godwit						1 F		
Brent Goose								
Common Gull								
Common Tern	26 R	21 R	4 F	12	6 F	8 F		2 M
Cormorant	23 R	15 R	1 R		36 R	12 R	1 F	7 R
Curlew		1 F		2		8 F		2 F
Dunlin								
Great Black-backed Gull								
Great Crested Grebe								
Greenshank		1 F				1 F		
Grey Heron	2 R	6 F		3	11 R	11 R		1 F
Herring Gull								
Lapwing								
Lesser Black-backed Gull								
Little Egret		1 F			5 R	3 R		1 F
Mallard	28 R	11 F			2 F	1 F		
Mediterranean Gull								
Mute Swan		2 R				1 F		
Oystercatcher		9 F		3	17 R	9 F	2 R	6 F
Red-breasted Merganser								
Redshank					1 F			
Sandwich Tern								
Shag	1 R			1	2 R			
Shelduck								
Snipe								
Teal								
Turnstone								
Whimbrel								
Other								
Common Sandpiper		2 R		1				
Ringed Plover				2				

Species	August 2024 - Breeding							
Bar tailed Godwit								
Black Guillemot								
Black-headed Gull								
Black-tailed Godwit				8 F		4 F		
Brent Goose								
Common Gull								
Common Tern						6 F	1 F	
Cormorant	2 F	16 R	3 F	3 F	148 R	43 R	2 R	17 R
Curlew	1 R	1 F		6 F		7 F		5 F
Dunlin								
Great Black-backed Gull								
Great Crested Grebe								
Greenshank	4 R					7 F	1 F	
Grey Heron	1 R	6 F	1 R	5 F	2 R	5 R		3 F
Herring Gull								
Lapwing								
Lesser Black-backed Gull								
Little Egret	1 R			1 F	7 R			
Mallard	14 R	2 F			19 R	4 F		
Mediterranean Gull								
Mute Swan								
Oystercatcher	25 R	29 F		42 F	2 R	4 F	1 M	27 F
Red-breasted Merganser								
Redshank						51 F		
Sandwich Tern		1 M				2 F	3 F	
Shag	1 F	2 F		2 R		3 R	4 R	3 F
Shelduck								
Snipe								
Teal								
Turnstone								
Whimbrel							1 F	
Other								
Gannet			1 M					
Ringed Plover				33 F				

4. ANALYSIS OF RESULTS BY SPECIES

4.1 Cormorant

4.2 Grey Heron

4.3 Shelduck

4.4 Lapwing

4.5 Dunlin

4.6 Black-tailed Godwit

4.7 Curlew

4.8 Redshank

4.9 Oystercatcher

4.10 Teal

4.11 Mallard

4.12 Brent Goose

4.13 Common Tern

4. ANALYSIS OF RESULTS IN THE CONTEXT OF CORK HARBOUR AS A WHOLE

Appendix 1, table 4.

Table 3

Table 3.

Species	IWeBS 5-year mean (2016-21) Cork Harbour	Max. Count for Study Area	Peak Count in Study Area as percentage of Cork Harbour 5-year mean
Bar tailed Godwit			
Black Guillemot			
Black-headed Gull		322	
Black-tailed Godwit			
Brent Goose	62	34	
Common Gull	218	102	
Common Tern		26	
Cormorant	256	426	
Curlew	942	31	
Dunlin	2738	97	
Great Black-backed Gull	131		
Great Crested Grebe	129		
Greenshank	97		
Grey Heron			
Herring Gull	171		
Lapwing	1114		
Lesser Black-backed Gull	164		
Little Egret			
Mallard	341		
Mediterranean Gull	130		
Mute Swan	48		
Oystercatcher	1136		
Red-breasted Merganser	58		

Redshank	1517		
Sandwich Tern	71		
Shag	8		
Shelduck	773		
Snipe	69		
Teal	1384		
Turnstone	95		
Whimbrel	4		
Other			
Gannet			
Ringed Plover	38		
Common Sandpiper	2		
Great Northern Diver			
Wigeon			

APPENDIX

Most Recent 5-year I-WeBS Data - Cork Harbour.

Table 4.

Species	1% national	1% international	2016 /2017	2017 /2018	2018 /2019	2019 /2020	2020 /2021	Mean	Peak Months

Figure 1: Count Areas Used in the Study

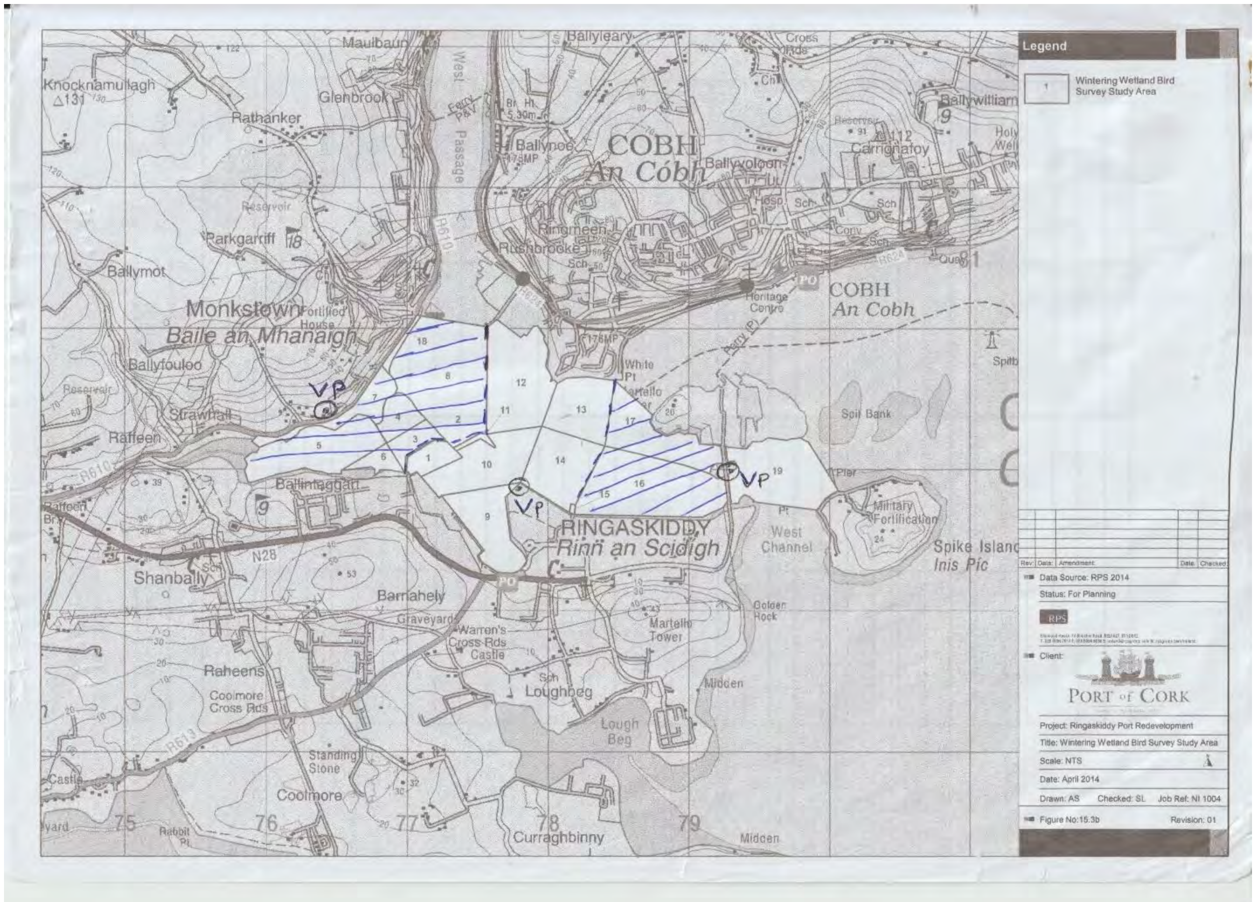


Figure 1: Viewing points marked on a map of west Cork Harbour. From left to right: Monktown, Ringaskiddy and Rocky Island.

Note, Rocky Island vantage point was used to survey an additional count area facing east towards Spike Island from May-August. (Count Area 4).

Figure 2: Stone Breakwater and ADM Jetty

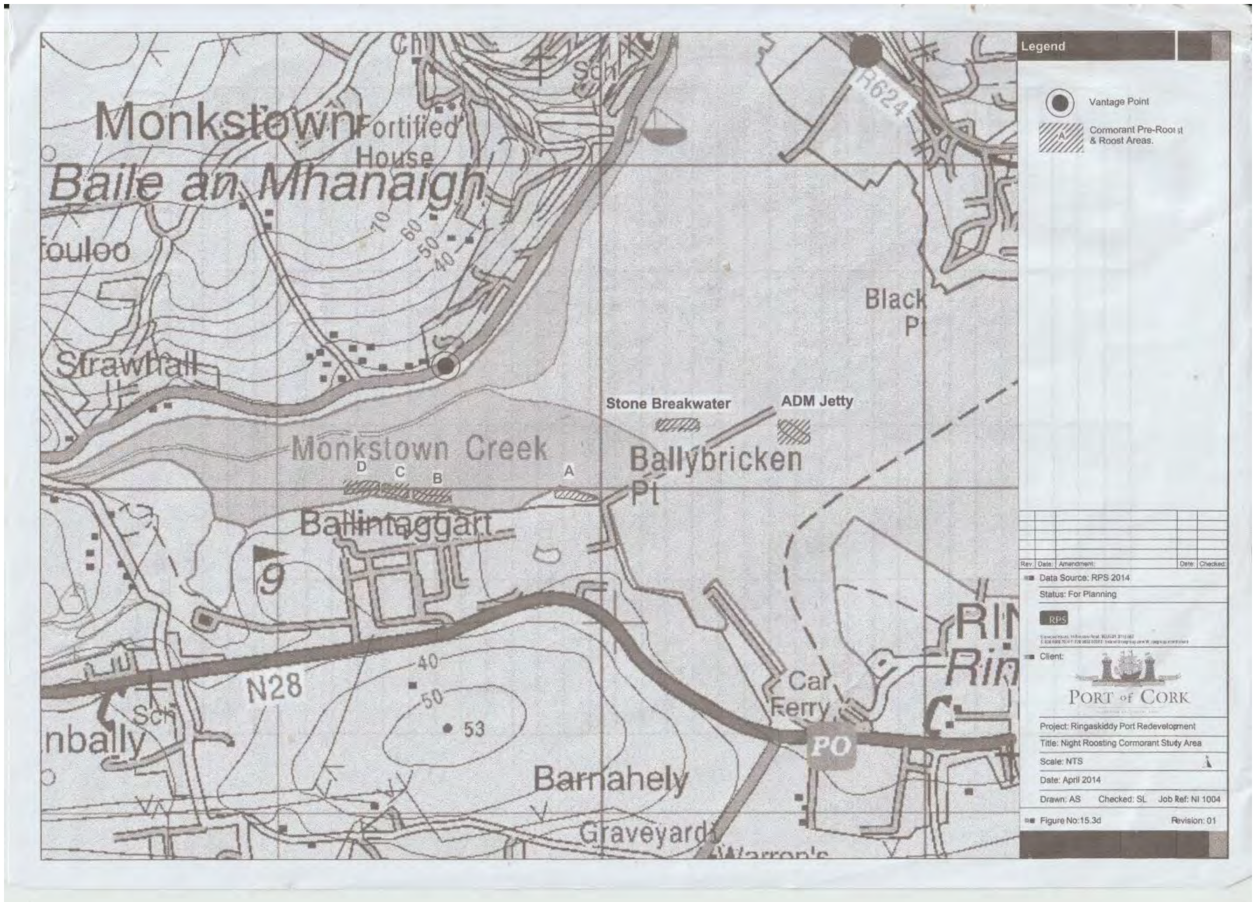


Figure 2: The stone breakwater and ADM jetty indicated just east of Monkstown Creek.

Appendix C – Ringaskiddy Marine Ecology Surveys (Aquafact, 2024)

AYESA (Port of Cork)

Beam Trawl Survey

Ringaskiddy, Cork Harbour

AQUAFACT Ref: P15494

November 2024

COMMERCIAL IN CONFIDENCE

Client: AYESA (Port of Cork)

Reference no: **P15494**

Date of issue: **11/11/2024**

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Tax Clearance Number: 559674

Report Approval Sheet

Client	**Ayesa (Port of Cork)**
Report Title	**Beam Trawl Survey – Ringaskiddy**
Job Number	**P15494**
Report Status	**Final**
Issue Date	**11/11/2024**

Rev	Status	Issue Date	Document File Name	Author (s)	Approved by:
1	Draft	29/08/2024	P15494_Ringaskiddy _Beam Trawl Port of Cork_v1	Jake Shiel – Ronan Browne	Shane O'Boyle
1	Final	11/11/2024	P15494_Ringaskiddy _Beam Trawl Port of Cork_Final	Ronan Browne	E. McCormack

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DAS	Dumping at Sea
IFI	Inland Fisheries Ireland
T1	Transect (Beam trawl)

1. Introduction

AQUAFACT - APEM Group (herein referred to as AQUAFACT) was commissioned by Ayesa on behalf of the Port of Cork Company to undertake a beam trawl survey at Ringaskiddy as part of preparing an Environmental Impact Assessment Report (EIAR) chapter on Marine Ecology for a proposed development.

In June and July of 2024 seven beam trawl transects (T) were carried out in the vicinity of the proposed development using a 2-metre beam trawl with an 11 mm mesh size. The survey transect trawls were conducted at a speed of 2 knots, resulting in an average trawl length transect of circa. 0.3 km (ranging from 0.2 to 0.6 km). Once brought on board, the contents of the trawl were placed into a container and photographed prior to processing. Fish and invertebrate species were separated, counted, and selected specimens measured to the nearest millimetre, with every effort made to return them to the water alive after processing. Other animal groups, such as colonial invertebrates (e.g., hydroids, bryozoans), were recorded based on their presence or absence.

This report provides an overview of the finfish and invertebrate species captured in each trawl, detailing the number of species, their relative abundance, and, where available, comparisons to relevant reports and data collected by Inland Fisheries Ireland (IFI). Additionally, the report includes information on the size distribution of selected species.

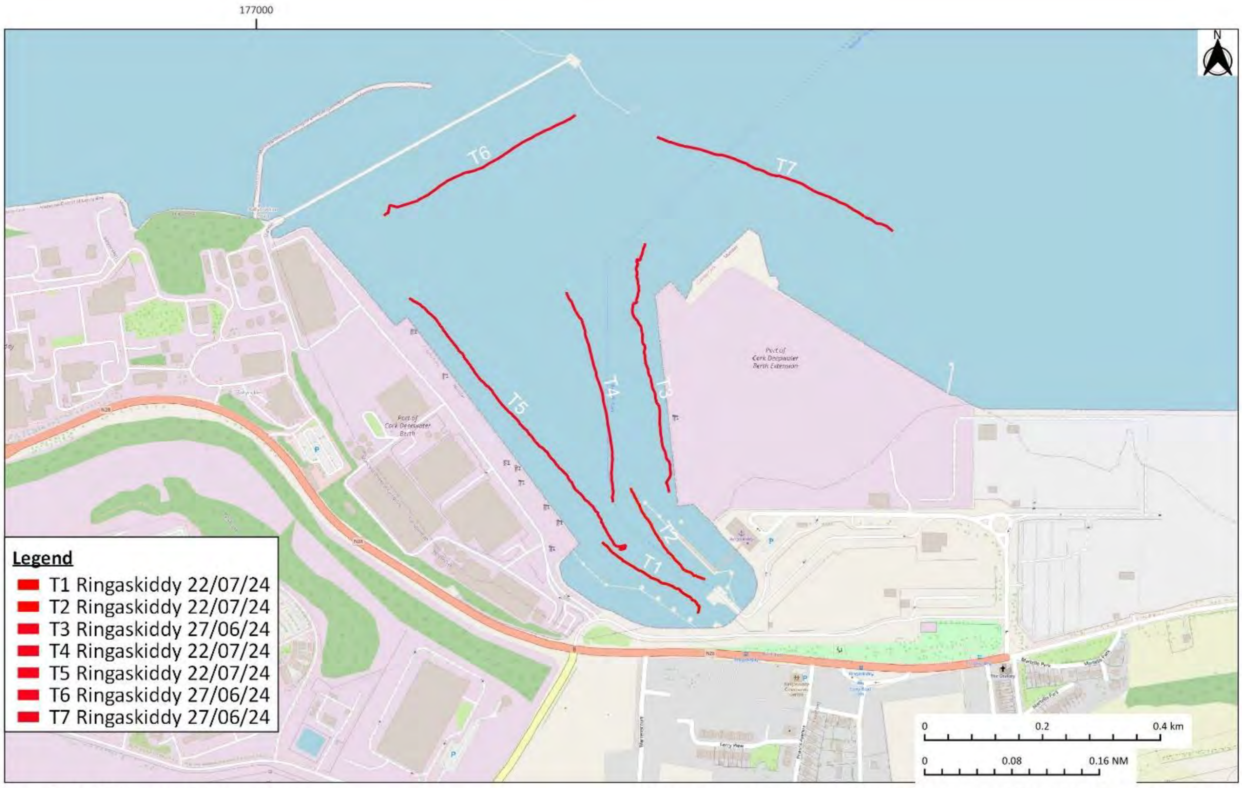
2. Methodology

AQUAFACT staff conducted the beam trawl survey on the 27th of June and the 22nd of July 2024 in the vicinity of Ringaskiddy. The survey utilised a two-metre-wide beam trawl equipped with a tickler chain and an 11 mm mesh (Figure 2-1), which was towed at a speed of 1.5 to 2.5 knots from the A-frame at the stern of the vessel. The beam trawl was deployed from the *Denis Murphy*, a vessel kindly provided by the Port of Cork.

Figure 2-1: Beam trawl (2 m diameter with an 11 mm mesh) on the deck of the Denis Murphy.

For this survey in the Ringaskiddy area, seven beam trawl transects (T1 to T7) were conducted. The track of each trawl was recorded using a handheld GPS and is plotted in Figure 2-2. After each transect, the beam trawl was recovered, the cod end sack opened, and the catch was deposited into a fish box. If a trawl contained a significant amount of mud, AQUAFACT staff used a deck hose and a 1 mm sieve to clean the catch upon retrieval. Most of the catch from each trawl was processed on deck by AQUAFACT staff, with some species retained for identification upon return to the AQUAFACT laboratory. Brown shrimp (*Crangon crangon*) and green crab (*Carcinus maenas*) species were identified and measured on board.

For this survey the catch of organisms was separated, identified, counted and the total length (the tip of the snout to the tip of the longer lobe of the caudal fin) of selected fish specimens measured to the nearest millimetre. Every attempt was made to return them alive to the water after processing. The size distribution of organisms such as green crabs (*Carcinus maenas*) and brown shrimp (*Crangon crangon*) were also assessed.



Coordinate Reference System: EPSG: 29903

Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors.

Figure 2-2: Location of trawl survey tracks (T1 to T7) for Ringaskiddy on the 27th of June and the 22nd of July 2024.

3. Results

3.1 Overview

This marine ecological survey was conducted using seven beam trawl transects (T1 to T7) as part of the baseline assessment for the Ringaskiddy EIAR. The beam trawls revealed a diverse assemblage of finfish species present as shown in Table 3-1.

Plaice (*Pleuronectes platessa*), a flat fish commonly found on sandy and muddy seabeds, was observed across most transects, with a peak in transect 5 (T5). The Sand Goby (*Pomatoschistus minutus*), a small demersal species often inhabiting shallow coastal waters, was the most abundant species, particularly in T1. The Reticulated Dragonet (*Callionymus reticulatus*), typically found in sandy and gravelly substrates, was present in several transects, with the highest numbers in T5. Dover Sole (*Solea solea*), a commercially significant species known for its preference for soft, sandy bottoms, was also recorded in good numbers, especially in T1. Other species like the Thornback Ray (*Raja clavata*), which frequents sandy, muddy, and gravelly areas, were noted, but in lower numbers. For the areas surveyed there was a greater species diversity in T1 and T4, with T5 also showing relative fish abundance, particularly of commercially important species. This data illustrates the ecological worth of the surveyed area, providing baseline information for evaluating the potential impacts of future developments in Ringaskiddy.

During the seven-beam trawl transects undertaken at Ringaskiddy, a total of 965 invertebrates were recorded, representing over 20 species. The most abundant species included the Harbour Crab (*Polybius depurator*), which was the most frequently captured with a total of 184 individuals, and the Green Crab (*Carcinus maenas*), with 177 individuals recorded across the transects. The Shrimp (*Palaemon serratus*) and Brown Shrimp (*Crangon crangon*) were also prevalent, with totals of 52 and 101 individuals, respectively. Other species of note observed include the Blue Mussel (*Mytilus edulis*), with 113 individuals, and Amphipods, with a significant single occurrence of 170 individuals in one transect. Additionally, Velvet Crabs (*Necora puber*) and Moon Jellyfish (*Aurelia aurita*) were found in smaller numbers. Species diversity varied across the transects, with the highest diversity observed in T7, where 12 different species were recorded. In contrast, T6 had the lowest species diversity, with only six species noted. Overall, the invertebrate community at Ringaskiddy was dominated by crabs and shrimps, with several other species contributing to the biodiversity of the area.

Specimens of the following species were measured during the survey: Green Crab (*Carcinus maenas*), Brown Shrimp (*Crangon crangon*), Velvet Swimming Crab (*Necora puber*), Thornback Ray (*Raja clavata*), Edible Crab (*Cancer pagurus*), Plaice (*Pleuronectes platessa*), Common Goby (*Pomatoschistus microps*), Sand Goby

(*Pomatoschistus minutus*), Grey Gurnard (*Eutrigula gurnardus*), Common Dragonet (*Callionymus lyra*), Black Goby (*Gobius niger*), Rock Goby (suspected), Butterfish, Fivebeard Rockling, Yellow Eel, Reticulated Dragonet, Dover Sole, Dab, Greater Pipefish, Pogge, 15-Spined Stickleback, and Nilsson's Pipefish.

3.2 Fish species

Table 3-1 shows the recorded catch data for various fish species collected by the beam trawl in different locations. The survey provided key insights into the fish populations across the seven transects (T1 to T7), highlighting the species diversity and abundance in the surveyed area. Species were also allocated their AphiaID identity number. The AphiaID platform is a system for managing taxonomic data, with an online environment that allows experts to update information efficiently. It underpins the World Register of Marine Species (WoRMS) and over 80 related databases, supporting both marine and non-marine data. AphiaID uses Life Science Identifiers (LSIDs) to provide unique, stable identifiers for each name, storing both accepted and unaccepted names while documenting their relationships. This makes AphiaID a key tool for taxonomic quality control and linking information across scientific names. It also plays a significant role in marine biodiversity informatics and supporting data integration (Vandepitte *et al.,* 2015). From the seven-beam trawl transects undertaken at Ringaskiddy there were a total of 148 finfish recorded and 17 species identified.

Plaice (*Pleuronectes platessa*) were found in all beam trawl transects except T3, with the highest counts recorded in T5, where eight individuals were captured. The Sand Goby (*Pomatoschistus minutus*) emerged as the most abundant finfish species overall, with a significant number of individuals observed in T1 (40 individuals) and presence across most transects, except T7. The Reticulated Dragonet (*Callionymus reticulatus*), typically found in sandy and gravelly substrates, was recorded in T1, T2, T4, and T5, with the highest count of ten individuals in T5. Dover Sole (*Solea solea*), a species of commercial significance often associated with soft, sandy bottoms, was present in T1, T4, and T5, with six individuals recorded in T1 (Table 3-1).

Other notable species recorded in Table 3-1 included the Thornback Ray (*Raja clavata*), found in T1, and T3, though in lower numbers, with just one individual per transect. The Five-bearded Rockling (*Ciliata mustela*) was present in T1 and T2, contributing a total of three individuals to the catch. The Black Goby (*Gobius niger*) was observed in T1, T4, and T7, with the highest count of four individuals in T7. The Butterfish (*Pholis gunnellus*) was exclusively found in T1, where two individuals were captured. Additional species, including Grey Gurnard, Common Goby, Common Dragonet, Yellow Eel, Rock Goby, Dab, Greater Pipefish, Fifteen-Spined Stickleback, Pogge, and Nilsson Pipefish, were recorded in smaller numbers across different transects.

Regarding total counts, T1 and T5 were the most populous transects. T1 had the highest overall fish abundance, with 61 individuals and the greatest species diversity, recording ten different species. T5 followed closely, with a total of 41 fish and high species diversity, particularly notable for species such as Sand Goby and Plaice.

Observations from the survey included the identification of Juvenile Pipefish and *Gobius* spp., each with two individuals observed in T4 and T1, respectively (Table 3-1). The presence of species like the Thornback Ray and Dover Sole indicates various demersal species in the area, reflecting the ecological substance of the surveyed habitats.

Table 3-1: Fin fish species and the number of individuals recorded during beam trawl transects (T1 to T7).

Species	**AphiaID**	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**	**T7**	**Total (T1 –T7)**
Plaice (*Pleuronectes platessa*)	127143	2	2		1	8	2		**15**
Grey Gurnard (*Eutrigula gurnardus*)	150637						1		**1**
Sand Goby (*Pomatoschistus minutus*)	126928	40	3		5	16	1		**65**
Black Goby (*Gobius niger*)	126892	1			1			4	**6**
Common Dragonet (*Callionymus lyra*)	126792						1		**1**
Common Goby (*Pomatoschitus microps*)	126927						2	4	**6**
Thornback Ray (*Raja clavata*)	105883	1		1					**2**
Dover Sole (*Solea solea*)	127160	6			4	5			**15**
Butterfish (*Pholis gunnellus*)	126996	2							**2**
Reticulated Dragonet (*Callionymus reticulatus*)	126795	4	2		4	10			**20**
Fivebeard Rockling (*Ciliata mustela*)	126448	2	1						**3**
Yellow Eel (*Anguilla anguilla*)	126281	1							**1**
Rock Goby (*Gobius paganellus*)	126893							1	**1**
Dab (*Limanda limanda*)	127139		1						**1**
Greater Pipefish (*Syngnathus acus*)	127387				1				**1**
Fifteen-Spined Stickleback (*Spinachia spinachia*)	126508				1	1			**2**
Pogge (*Agonus cataphractus*)	127190				1				**1**
Nilsson Pipefish (*Syngnathus rostellatus*)	127389					1			**1**
Juvenile Pipefish					2				**2**
Gobius Species		2							**2**
Total number of fish		**61**	**9**	**1**	**20**	**41**	**7**	**9**	**148**
Total number of species		**10**	**5**	**1**	**9**	**6**	**5**	**3**	

Fish species specimens measured during the survey included Plaice (*Pleuronectes platessa*), Common Goby (*Pomatoschistus microps*), Sand Goby (*Pomatoschistus minutus*), Grey Gurnard (*Eutrigula gurnardus*), Common Dragonet (*Callionymus lyra*), Black Goby (*Gobius niger*), and the suspected Rock Goby. Other fin fish measured were Butterfish, Fivebeard Rockling, Yellow Eel, Reticulated Dragonet, Dover Sole, Dab, Greater Pipefish, Pogge, 15-Spined Stickleback, Nilsson's Pipefish, and Thornback Ray (*Raja clavata*).

Figure 3-1 illustrates the size distribution of Plaice (*Pleuronectes platessa*) recorded across all trawls. The majority of individuals were clustered between 74-82 mm in length, with an apparent peak at 76-78 mm. Fewer numbers of individuals are observed at 88-90 mm and in the largest size category of 124-126 mm. The distribution indicates a range of Plaice sizes, with the most common being in the mid-range (around 74-82 mm). The data suggests some variability, with a few individuals recorded at both smaller and larger sizes.

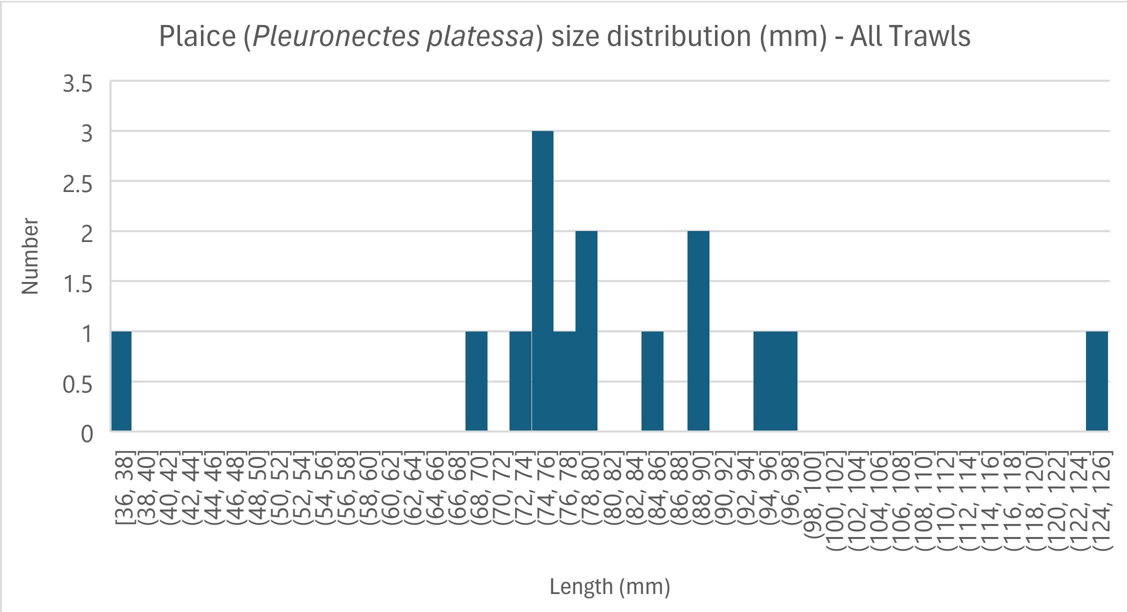


Figure 3-1: Size distribution (mm) of Plaice (*Pleuronectes platessa*), recorded in all trawls.

Figure 3-2 shows the size distribution of Sand Goby (*Pomatoschistus minutus)* across all trawls, with many individuals measuring between 45-55 mm, and a noticeable peak at 49-51 mm.

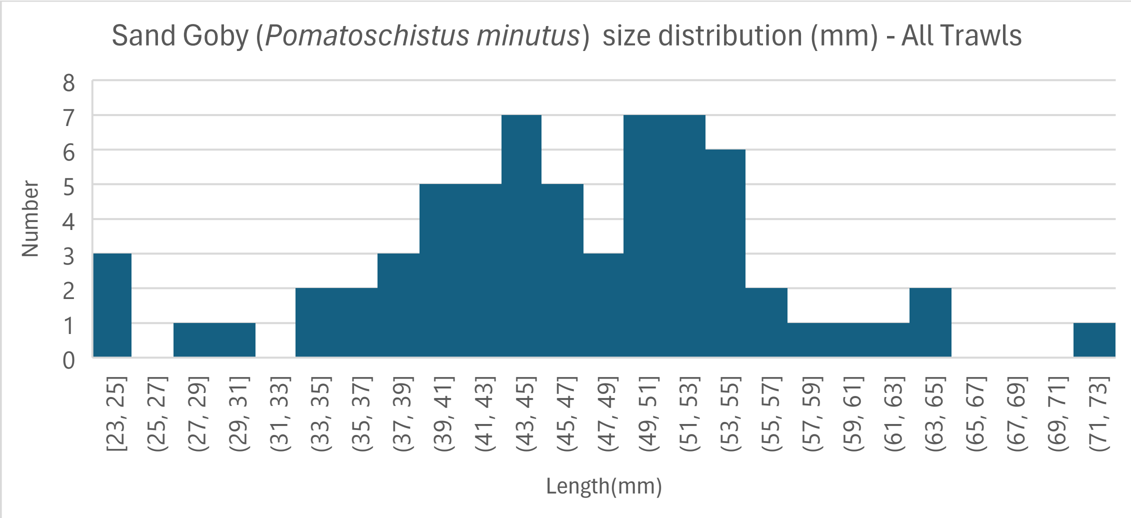


Figure 3-2: Size distribution (mm) of Sand Gobies (*Pomatoschistus minutus*), recorded in all trawls.

Figure 3-3 displays the size distribution of Reticulated Dragonet across all trawls. Most individuals fall within the 55-61 mm range, with a notable peak at 55-57 mm. There is a smaller cluster of sizes in the 63-69 mm range, and a single outlier at 127-129 mm. The distribution indicates that most of the Reticulated Dragonet captured were within the mid-size range, with very few large individuals.

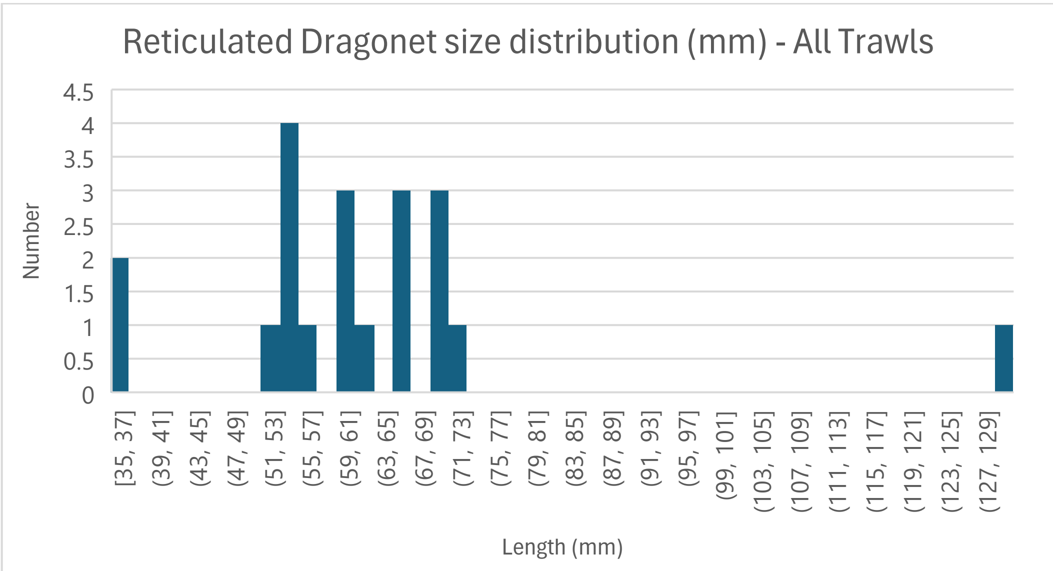


Figure 3-3: Size distribution (mm) of Reticulated Dragonet, recorded in all trawls.

3.3 Invertebrates

The seven-beam trawl transects at Ringaskiddy recorded a total of 965 invertebrates (individuals) representing more than 20 species (Table 3-2). The most abundant species found were the Harbour Crab (*Polybius depurator*) with 184 individuals, and the Green Crab (*Carcinus maenas*), which accounted for 177 individuals. Both species were present across multiple transects, indicating their widespread distribution in the area. Other significant species included the Blue Mussel (*Mytilus edulis*), which was notably abundant in transect T3 with 76 individuals and had a total of 113 across all transects. The Brown Shrimp (*Crangon crangon*) also appeared in significant numbers, with 101 individuals recorded overall (Table 3-2).

Less common species recorded during the survey included the Velvet Crab (*Necora puber*), with a total of 19 individuals, and various other species such as the Anemones, Brittlestar, and Hermit Crab, each of which was found in low numbers. Notably, a large single occurrence of Amphipods was recorded, with 170 individuals captured in one transect, contributing significantly to the total count. The survey also recorded unique species like the Cuttlefish and Cockle, each with only two individuals. This beam trawl data collection provides essential insights into the invertebrate populations and their distribution in the Ringaskiddy area.

Table 3-2: Invertebrate species and number of individuals recorded at each trawl transects (T1 to T7).

Species	AphiaID	T1	T2	T3	T4	T5	T6	T7	Total number (T1 - T7)
Shrimp (*Palaemon serratus)*	107616	22	19	1	2	6		2	**52**
Moon Jelly fish (*Aurelia aurita*)	135306			3				2	**5**
Harbour crab (*Polybius depurator*)	107387	33	28	1	41	61	13	7	**184**
Velvet crab (*Necora puber*)	107398		5				1	13	**19**
Blue mussel (*Mytilus edulis*)	140480	2	13	76	7	12		3	**113**
Common starfish (*Asterias rubens*)	123776				1		1	1	**3**
Hermit crab (*Pagurus bernhardus*)	107232						4		**4**
Anemones (Sea anemone)				1	2				**3**
Brittlestar Sp.								1	**1**
Brown crab (*Cancer pagurus*)	107276	1	1	1					**3**
Acidians Sp.		73	6		6	2		1	**88**
Sponge Sp.		15		11		2		1	**29**
Broad-clawed porcelain crab (*Porcellana platycheles*)	107190			1					**1**
Hornwrack - bryozoan (*Flustra foliacea*)	111367							1	**1**

Species	AphiaID	T1	T2	T3	T4	T5	T6	T7	Total number (T1 - T7)
Green Crab (*Carcinus maenas*)	107381	61	13	17	37	33	13	3	**177**
Brown Shrimp (*Crangon crangon*)	107552	29	6	8	29	16	4	9	**101**
Long legged spider crab (*Macropodia rostrata*)	107345	3	1						**4**
Amphipod		170							**170**
Cuttlefish		2							**2**
Cockle					2				**2**
Polychaete sp.						3			**3**
Total Invertebrates		**411**	**92**	**120**	**127**	**135**	**36**	**44**	**965**
Total Species		**11**	**9**	**10**	**9**	**8**	**6**	**12**	

An aspect of this survey involved the measurement of size distribution of green crab and brown shrimp as these have been studied in other areas close to Ringaskiddy. The size distribution for green crab and brown shrimp respectively for all trawls are presented in Figure 3-4 and Figure 3-5.

Figure 3-4 shows the frequency distribution of Green Crab (*Carcinus maenas*) carapace widths across a range of measurements. The most common carapace widths are clustered around 20 mm, 40 mm, and 45 mm, with these sizes showing the highest frequency of occurrence. The distribution illustrates a spread of carapace widths from as small as 5 mm up to 67 mm, with a noticeable peak in the 20-25 mm and 40-45 mm ranges, indicating these are the most prevalent sizes within the sampled population.

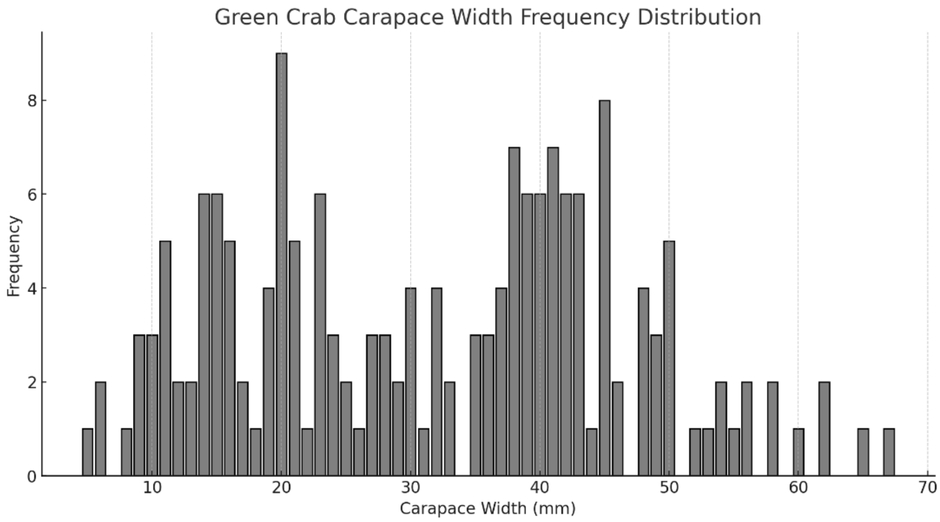


Figure 3-4: Size distribution (carapace width mm) of Green Crab (*Carcinus maenas*) in all trawls.

Figure 3-5displays the length frequency distribution of Brown Shrimp (*Crangon crangon*) captured across various trawls. The majority of shrimp fall within the 30-45 mm length range, with the highest frequency observed between 35-40 mm. There are smaller numbers of shrimp in the smaller size ranges (15-30 mm) and the larger size ranges (45-65 mm), indicating that the population sampled was predominantly composed of mid-sized individuals. This distribution suggests that the Brown Shrimp in the sampled area are mostly of intermediate size, with fewer very small or very large individuals. It is possible that the size distribution of shrimp that were captured was on account of mesh selectivity.

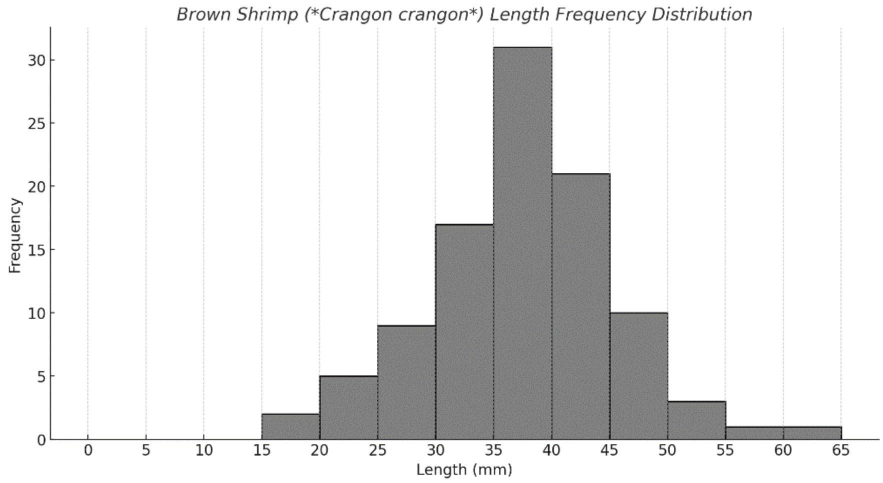


Figure 3-5:Size distribution (mm) of Brown Shrimp (*Crangon crangon*) in all trawls.

Other invertebrate species measured during the survey included the Velvet Swimming Crab (*Necora puber*), and Edible Crab (*Cancer pagurus*).

4. Discussion

A beam trawl survey was conducted in 2012 as part of the EIS process for the proposed developments at Ringaskiddy. However, to ensure the validity of biological survey information for an EIAR, the data must be recent and reflect current site conditions. Biological surveys are typically considered valid for up to two years, though this timeline may vary depending on project specifics or the species studied. Therefore, the outdated beam trawl data necessitated a supplementary survey to provide accurate and up-to-date ecological information, which is essential to meet the requirements of Directive 2014/52/EU, ensuring decision-makers have reliable data when assessing the environmental impact of projects.

A beam trawl study for the Ringaskiddy NIS in 2012 was conducted in the Ringaskiddy Basin on August 27th, 2013, including areas within the Basin and along the edge of the Oyster Bank at the eastern approaches. Eight trawls (T1-T8) were performed using a 1.5m beam trawl, with the trawl tracks recorded using a Trimble Geo-XM GPS (Figure 4-1).

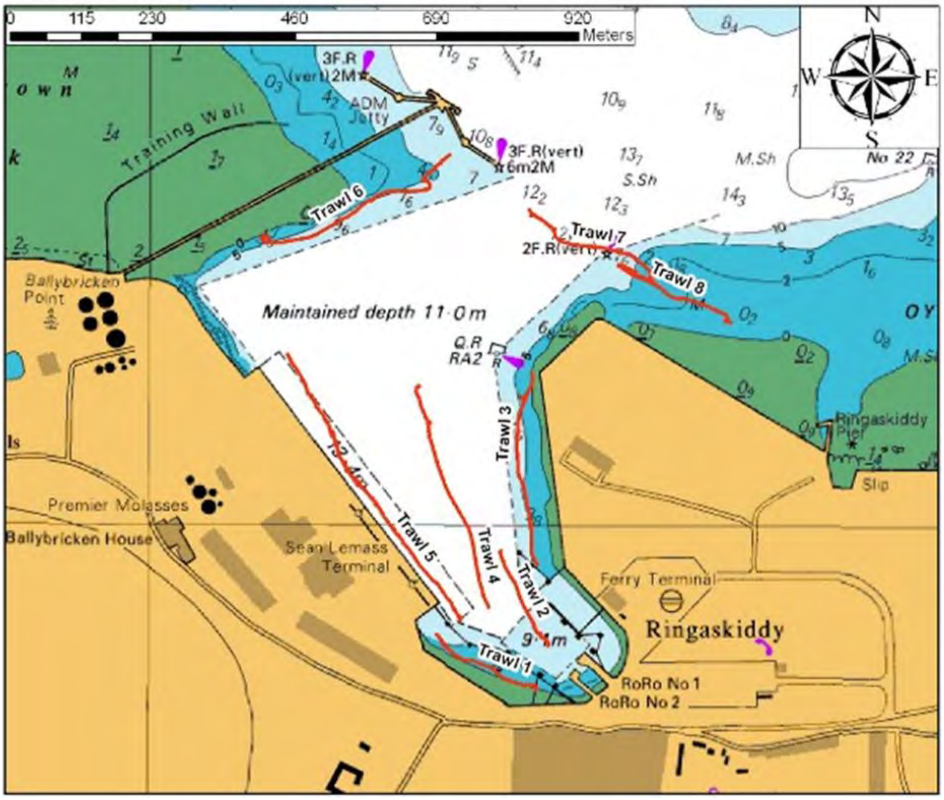


Figure 4-1: Ringaskiddy Basin showing locations of 8 beam trawls (T1-T8) August 2013 (Source RPS report)

The fisheries result from these trawls, along with prior surveys conducted by Inland Fisheries Ireland (IFI) under the Water Framework Directive (WFD) for the Greater Cork Harbour area, provide an overview of marine and estuarine species. In the 2010 IFI surveys, the most abundant species included sprat, sand goby, juvenile mullet, and common goby. The 2010 IFI survey identified 29 species in total, with sprat and sand goby being particularly dominant (IFI 2011).

The 2013 Ringaskiddy Basin trawls showed that plaice was the most frequently captured fish, appearing in seven out of eight trawls and being the most abundant species. Other species were encountered in lower numbers, with sand goby recorded in two trawls. The soft-bottom habitats likely contributed to the prevalence of juvenile flatfish. Pelagic species like sprat and mackerel were also observed in small shoals near the water surface.

In 2013 invertebrates, including brown shrimp (*Crangon crangon*), green crabs (*Carcinus maenas*), swimming crabs (*Polybius spp*.), and hermit crabs, were dominant in the trawls, particularly in T6 where a high number of hermit crabs were recorded. The presence of significant amounts of brown and green seaweeds in some trawls suggests the area functions as a nursery for juvenile fish and mobile epibenthic crustaceans, emphasizing the ecological importance of the Ringaskiddy Basin.

There are several differences between the 2013 survey and the 2024 report. In 2013, a 1.5 m diameter beam trawl was used, whereas in 2024, a larger 2 m trawl was employed. Additionally, eight trawls were conducted in 2013, compared to seven trawls in 2024. However, T7 (Figure 2-2) in 2024 roughly approximates to Trawl 7 and 8 undertaken in 2013.

Comparing the surveys, the 2024 survey recorded a broader range of species and a higher overall abundance of both finfish and invertebrates compared to the 2013 survey. The use of a larger beam trawl in 2024 likely contributed to this increased diversity and abundance. Plaice remained a consistent presence across all surveys, highlighting the species' significance in the Ringaskiddy Basin.

The 2024 survey provided more information to understanding of the area’s ecological structure, particularly through some additional data for key invertebrate species. Overall, the information from these surveys is very useful for assessing changes at the site and the potential impact of future developments in the area.

5. Conclusion

This beam trawl survey undertaken by AQUAFACT in 2024 recorded a diverse array of finfish species (20). With plaice (*Pleuronectes platessa*) being among the most frequently observed, particularly in transect T5. Sand goby (*Pomatoschistus minutus*) emerged as the most abundant fish species overall, especially in T1. Other significant species included the reticulated dragonet (*Callionymus reticulatus*), which was most prevalent in T5, and Dover sole (*Solea solea*), which showed a preference for soft, sandy bottoms. The results highlighted the ecology of the surveyed area. Transects T1 and T5, which exhibited high species diversity and abundance.

In total, there were 965 individual invertebrates recorded, representing over 20 species were noted across the seven transects in 2024. The harbour crab (*Polybius depurator*) was the most captured invertebrate, followed closely by the green crab (*Carcinus maenas*). Brown shrimp (*Crangon crangon*) were also prevalent in the landings. The beam trawl survey revealed varying species diversity across each transects, with T7 recording the highest diversity of species. The data collected provides valuable insights into the invertebrate populations of the area, with crabs and shrimp dominating much of the catches.

The survey methodology also involved measuring the size distribution of some key invertebrate species such as green crab and brown shrimp. The size distribution of green crabs showed a concentration of individuals with carapace widths around 20 mm, 40 mm, and 45 mm, indicating these were the most common sizes within the sampled population. Brown shrimp size distribution revealed that most individuals fell within the 30-45 mm range, suggesting a high proportion of mid-sized shrimp in the area.

6. References

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7. Appendix

7.1 Appendix 1: Recorded fish size measurements (mm) from T1 to T7.

Table 7-1: Size distribution (mm) of Plaice (*Pleuronectes platessa*) (T1 to T7).

Plaice (*Pleuronectes platessa*)						
T1	T2	T3	T4	T5	T6	T7
125	98		76	95	74	
90	75			78	75	
				85		
				70		
				80		
				79		
				90		
				36		

Table 7-2: Size distribution (mm) of Common Goby (*Pomatoschitus microps*) (T1 to T7).

Common Goby (*Pomatoschitus microps*)						
T1	T2	T3	T4	T5	T6	T7
					40	38
					36	52
						39
						43

Table 7-3: Size distribution (mm) of Sand Goby (*Pomatoschistus minutus*) (T1 to T7).

Sand Goby (*Pomatoschistus minutus*)						
T1	T2	T3	T4	T5	T6	T7
73	40		54	56	47	
55	55		61	62		
52	40		42	58		
55			53	55		
50			65	50		
51				50		
64				52		
42				45		
37				45		
47				40		
45				47		
42				42		
55				40		
36				39		
52				48		
53				25		
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29						

Table 7-4: Size distribution (mm) of Grey Gurnard (*Eutrigula gurnardus*) (T1 to T7).

Grey Gurnard (*Eutrigula gurnardus*)						
T1	**T2**	**T3**	**T4**	**T5**	**T6**	**T7**
					46	

Table 7-5: Size distribution (mm) of Common Dragonet (*Callionymus lyra*) (T1 to T7).

Common Dragonet (*Callionymus lyra*)						
T1	T2	T3	T4	T5	T6	T7
					45	

Table 7-6: Size distribution (mm) of Black Goby (*Gobius niger*) (T1 to T7).

Black Goby (*Gobius niger*)						
T1	T2	T3	T4	T5	T6	T7
104			85			73
						92
						93
						71

Table 7-7: Size distribution (mm) of Rock Goby (*Gobius paganellus* - suspected) (T1 to T7).

Rock Goby (*Gobius paganellus*) (Suspected)						
T1	T2	T3	T4	T5	T6	T7
						85

Table 7-8: Size distribution (mm) of Butterfish (*Pholis gunnellus*) (T1 to T7).

Butterfish (*Pholis gunnellus*)						
T1	T2	T3	T4	T5	T6	T7
140						
140						

Table 7-9: Size distribution (mm) of Five Bearded Rockling (*Ciliata mustela*) (T1 to T7).

Five Bearded Rockling (*Ciliata mustela*)						
T1	T2	T3	T4	T5	T6	T7
87	51					
61						

Table 7-10: Size distribution (mm) of Yellow eel (*Anguilla anguilla*) (T1 to T7).

Yellow eel (*Anguilla anguilla*)						
T1	T2	T3	T4	T5	T6	T7
190						

Table 7-11: Size distribution (mm) of Reticulated Dragonet (*Callionymus reticulatus*) (T1 to T7).

Reticulated Dragonet (*Callionymus reticulatus*)						
T1	T2	T3	T4	T5	T6	T7
61	66		71	73		
55	60		67	62		
53			35	71		
37			131	70		
				66		
				55		
				56		
				60		
				55		
				55		

Table 7-12: Size distribution (mm) of Dover sole (*Solea solea*) (T1 to T7).

Dover Sole (*Solea solea*)						
T1	T2	T3	T4	T5	T6	T7
60			89	52		
65			62	70		
70			80	56		
68			76	64		
60				65		
65						

Table 7-13: Size distribution (mm) of Dab (*Limanda limanda*) (T1 to T7).

Dab (*Limanda limanda*)						
T1	T2	T3	T4	T5	T6	T7
	120					

Table 7-14: Size distribution (mm) of Greater pipe fish (*Syngnathus acus*) (T1 to T7).

Greater Pipefish (*Syngnathus acus*)						
T1	T2	T3	T4	T5	T6	T7
			239			

Table 7-15: Size distribution (mm) of Pogge (*Agonus cataphractus*) (T1 to T7).

Pogge (*Agonus cataphractus*)						
T1	T2	T3	T4	T5	T6	T7
			97			

Table 7-16: Size distribution (mm) of 15-spined stickleback (*Spinachia spinachia*) (T1 to T7).

15-spined stickleback (*Spinachia spinachia*)						
T1	T2	T3	T4	T5	T6	T7
			77	57		

Table 7-17: Size distribution (mm) of Nilsson's Pipefish (*Syngnathus rostellatus*) (T1 to T7).

Nilsson's Pipefish (*Syngnathus rostellatus*)						
T1	T2	T3	T4	T5	T6	T7
				158		

Table 7-18: Size distribution (mm) of Thornback Ray (*Raja clavata*) (T1 to T7).

Thornback Ray (*Raja clavata*)								
T1		T2	T3		T4	T5	T6	T7
Length	215		Length	180				
Width	132		Width	108				

7.2 Appendix 2: Recorded invertebrate size measurements (mm) from T1 to T7.

Table 7-19: Size distribution (mm) of Green Crab (*Carcinus maenas*) (T1 to T7).

Green Crab (*Carcinus maenas*)						
T1	T2	T3	T4	T5	T6	T7
40	30	67	50	56	50	32
48	40	46	62	40	45	38
48	33	38	38	46	45	20
58	42	45	45	39	43	
36	45	49	41	42	48	
44	28	53	39	62	35	
43	20	60	58	49	32	
43	20	28	49	45	30	
41	36	40	37	41	37	
38	24	48	42	35	40	
41	27	37	50	56	40	
26	21	17	45	50	24	
65	20	17	31	36	21	
41		15	41	38		
43		29	32	54		
35		19	23	43		
39		15	26	39		
30			23	39		
11			41	54		
25			21	32		
27			21	45		
20			28	33		
23			29	42		
19			24	42		
23			21	55		
25			27	37		
11			38	42		
18			19	50		
16			14	39		
23			14	52		
20			13	43		
9			22	38		

Green Crab (*Carcinus maenas*)						
T1	T2	T3	T4	T5	T6	T7
6			20	30		
23			39			
16			15			
16			19			
9			14			
15						
10						
5						
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Table 7-20: Size distribution (mm) of Brown Shrimp (*Crangon crangon*) (T1 to T7).

Brown Shrimp (*Crangon crangon*)						
T1	T2	T3	T4	T5	T6	T7
31	40	38	42	44	36	38
41	51	25	40	48	38	36
30	40	39	43	50	43	34
28	40	31	40	38	41	32
32	35	35	43	23		33
36	57	32	40	45		34
38		29	36	45		33
29		60	35	35		32
24			36	45		36
23			27	45		
35			41	45		
31			37	46		
32			41	38		
25			37	42		
36			45	40		
27			43	24		
31			39			
36			45			
27			40			
26			50			
23			45			
34			36			
42			37			
36			35			
39			35			
34			42			
19			27			
18			32			
32			35			

Table 7-21: Size distribution (mm) of Velvet Swimming Crab (*Necora puber*) (T1 to T7).

Velvet Swimming Crab (*Necora puber*)						
T1	T2	T3	T4	T5	T6	T7
					40	60
						64
						80
						78
						87
						85
						80
						64
						78
						65
						85
						58
						45

Table 7-22: Size distribution (mm) of Edible Crab (*Cancer Pagurus*) (T1 to T7).

Edible Crab (Cancer Pagurus)						
T1	T2	T3	T4	T5	T6	T7
		82				

AYESA (Port of Cork)

Marine Mammal Observer Survey – Ringaskiddy, Cork Harbour

AQUAFACT Ref: P15494

November 2024

COMMERCIAL IN CONFIDENCE

AQUAFACT
APEM Group

Report Approval Sheet

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1. Introduction

AQUAFACT - APEM Group (herein referred to as AQUAFACT) were commissioned by Ayesa and behalf of the Port of Cork Company to undertake a marine mammal observer survey at Ringaskiddy as part of preparing an EIAR chapter on Marine Ecology for proposed developments.

In July and August of 2024, a series of land-based watches over the proposed development area were carried out from five vantage points to record any marine mammal activity (Figure 1-1). Where possible, a photograph of a species was captured alongside its behaviour. Additionally, the time, coordinates of the species, and environmental conditions each day were recorded.

This report provides an overview of the marine mammals recorded during the survey period and, where available, comparisons to relevant data collected by bodies such as the Irish Whale and Dolphin Group (IWDG) and the National Biodiversity Data Centre (NBDC).

Figure 1.1 shows the vantage points selected for the Marine Mammal Observer Surveys.

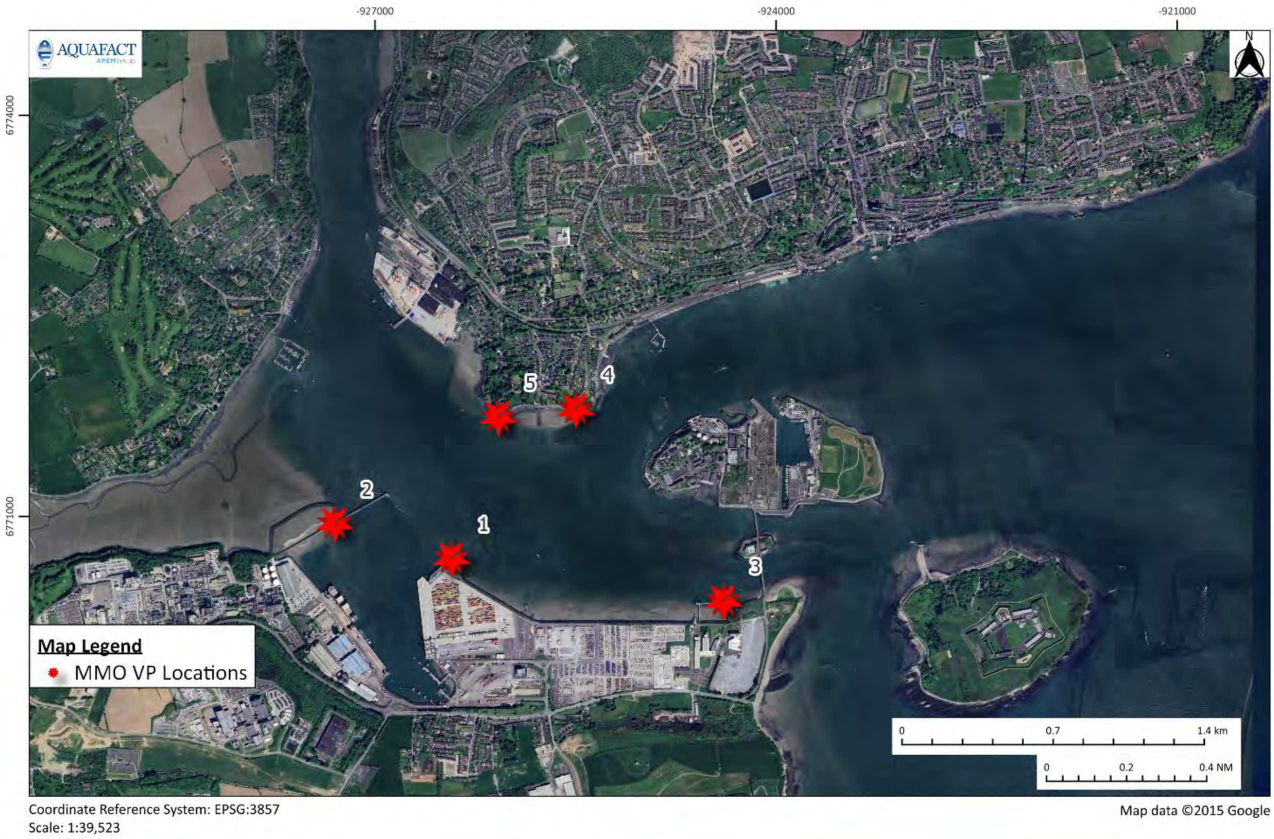

Figure 1-1- Marine Mammal Observer Vantage Point locations.

2. Statement of Authority

Marine Mammal Observer (MMO) surveys of the Ringaskiddy port area were carried out for 5 days between the 22nd of July 2024 and the 1st of August 2024. Brónagh Boylan (BSc.) and Niamh Lynch (BSc., MSc.) are fully trained AQUAFACT MMO surveyors. Both Brónagh and Niamh hold the JNCC certification- *Marine Mammal Observer (MMO) Guidelines for Industry- Marine Mammal Mitigation* and the NPWS certification – *Irish Mitigation Guidelines for Industry*. This report has been prepared by Brónagh, who has a range of experience in ecological surveying and assessment.

3. Methodology

3.1 Desk Study

A desk study was carried out to provide background on the presence, or absence, of marine mammals within the proposed development area. Sources such as the National Biodiversity Data Centre (NBDC) and Irish Whale and Dolphin Group (IWDG) were used for the purpose of this study. The results of this search can be found in Section 4.1 below.

3.2 Field Survey

A detailed account of the methodology used for the Marine Mammal Observer surveys carried out for the proposed development can be found in the following sub-sections, while detailed results can be found in Section 4.2 below.

3.2.1 Data Collection

The Marine Mammal Observer (MMO) survey was carried out on the following dates:

22nd of July 2024

23rd of July 2024

30th of July 2024

31st of July 2024

1st of August 2024

All surveys were carried out by AQUAFACT staff who hold the JNCC certification- Marine Mammal Observer (MMO) Guidelines for Industry- Marine Mammal Mitigation and the NPWS certification – Irish Mitigation Guidelines for Industry. The waters in the vicinity of the Ringaskiddy port facilities were surveyed from a range of vantage points (see Figure 1-1). Depending on the date, surveys were carried out either side of low water or either side of high water. To replicate previous survey effort. Surveyors used a 10 x 50 pair of binoculars and a Canon EOS 2000D camera with a 75-300mm lens, as recommended in current MMO guidelines. Effort watches were stopped when weather conditions were deemed unfavourable, *i.e.*, sea state = choppy (many white caps) and/or swell = medium (2-4 m) and/or visibility = poor (less than 1km), however watches were carried out these conditions when the observer deemed it appropriate.

Effort watches was focused on an arc of 180° and up to 1km distance in priority. Sightings outside of this distance are extremely hard to record. Effort watches were conducted with the naked eye and the help of a 10x50 binoculars, to confirm species identification, group size and behaviour of the animals encountered.

Species identification, group size, age composition, heading and behaviour of the animals were also recorded for each sighting. All sightings were identified to species level when possible. However, whether the identification could not be confirmed, appropriate taxonomic levels and associated confidence levels were assigned to the animals observed. All cetacean sightings that occurred off effort and were reported to the MMO were also recorded as auxiliary sightings in an independent form.

Environmental variables were also recorded every hour approximately and/or when a weather variable changed. These variables included:

- Wind direction: in degrees.
- Wind force: in Beaufort scale.
- Sea state: g = glassy (like mirror), s = slight (no/few white caps), c = choppy (many white caps), r = rough (big waves, foam, spray).
- Swell: o = low (< 2m), m = medium (2-4 m), 1 = large (> 4m).
- Visibility: p = poor (< 1km), m = moderate (1-5 km), g = good (> 5km).
- Sun glare: n = none, wf = weak forward, sf = strong forward, vf = variable forward, wb = weak behind, sb = strong behind, vb = variable behind.
- Precipitation: n = none, l = light rain, m = moderate rain, h= heavy rain, s = snow.

The 'Marine Mammal recording form' for sightings include several parameters including:

- Date, time, position of the encounter,
- Species group and behaviour,
- Group size (number of adults, juveniles and calves),
- Bearing of the animal,
- Range to the animal, and
- Direction of travel.

3.2.2 Data Treatment

All watches and sightings data were recorded in an excel file.

4. Results

4.1 Desk Study

A search was carried out on the National Biodiversity Data Centre (NBDC) map viewer to note any records of marine mammals in the vicinity of Ringaskiddy port. The 2km grid squares W76S and W76X were selected, and the results of the search are detailed below.

The results of the search showed 5 records of marine mammal have been noted since 2002, however only 2 of these records have occurred in the last 10 years; in 2014 one common seal (*Phoca vitulina*) was recorded (IWDG Causal Cetacean Sightings Database), and in 2017 one common porpoise (*Phocoena phocoena*) was recorded. Both records were within W76X.

A search was carried out of the Irish Whale and Dolphin Sightings Database, which holds records of the last 12 months of sighting data. The results showed no records of marine mammals within the last 12 months in the Ringaskiddy, or nearby Carrigaline area.

The proposed development site is not located within a Special Area of Conservation (SAC), Special protection Area (SPA) or Natural Heritage Area (NHA).

4.2 Field Surveys

4.2.1 Survey Effort and Weather Conditions

A total of 20 hours of surveys were carried out across 5 days. Effort watches were recorded hourly on each survey. Weather conditions did not limit survey effort, the conditions on the 27th of July were most variable however the majority of the survey was conducted in favourable conditions. Table 4-1 shows the details of the effort watches.

Table 4-1- Record of MMO effort watches.

Date	Time of Start	Time of End	Location	Wind Direction (°)	Wind Force (Beaufort Scale)	Swell	Precipitation	Tide
22/07/24	17:00	18:00	Location 1	NE	3	o	l	High
22/07/24	18:00	19:00	Location 1	E	4	o	n	High
22/07/24	19:00	20:00	Location 1	E	5	o	h	High
22/07/24	20:00	21:00	Location 1	E	4	o	m	High
23/07/24	12:00	13:00	Location 2	S	1	o	n	Low
23/07/24	13:00	14:00	Location 2	S	0	o	n	Low

Date	Time of Start	Time of End	Location	Wind Direction (°)	Wind Force (Beaufort Scale)	Swell	Precipitation	Tide
23/07/24	14:00	15:00	Location 2	SE	2	o	n	Low
23/07/24	15:00	16:00	Location 2	SE	1	o	n	Low
30/07/24	11:45	12:45	Location 3	NE	2	o	n	High
30/07/24	12:45	13:45	Location 3	NE	2	o	n	High
30/07/24	13:45	14:45	Location 3	NE	2	o	n	High
30/07/24	14:45	15:45	Location 3	NE	2	o	n	High
31/07/24	07:20	08:20	Location 4	NE	1	o	n	Low
31/07/24	08:20	09:20	Location 4	NE	1	o	n	Low
31/07/24	09:20	10;20	Location 4	NE	1	o	n	Low
31/07/24	10:20	11:20	Location 4	NE	1	o	n	Low
01/08/24	08:25	09:25	Location 5	NW	1	o	n	Low
01/08/24	09:25	10:25	Location 5	NW	1	o	n	Low
01/08/24	10:25	11:25	Location 5	NW	2	o	n	Low
01/08/24	11:25	12:25	Location 5	NW	2	o	n	Low

4.2.2 Sightings

Table 4-2- Total number of sightings per marine mammal over the 5-day survey period.

Date	Otter *Lutra lutra*	Harbour seal *Phoca vitulina*	Grey seal *Halichoerus grypus*	Total
22/07/24	1			1
23/07/24		1	1	2
30/07/24		6		6
31/07/24		2		2
01/08/24		17		17

The two seal species encountered were the harbour seal (*Phoca vitulina*) and the grey seal (*Halicheros grypus*) (Table 4-2). The harbour seal was the most sighted species, with a haul out location adjacent to Location 2, near the port jetty (Figure 4-2).

Harbour seal were also recorded both hauled-out and travelling through the proposed development area (Figure 4-32, Figure 4-3). A grey seal (*Halichoerus grypus*) was recorded travelling through the port development area. Otter *Lutra lutra* was recorded at 20:39pm on the 22[nd] of July, near Location 1.

Figure 4-1- Harbour seal (*Phoca vitulina*) haul-out site location.

Figure 4-2- Harbour seal (*Phoca vitulina*) recorded hauled-out adjacent to the port jetty.

Figure 4-3- Harbour seal (*Phoca vitulina*) recorded travelling through the proposed development area.

There were 3 different behaviours recorded during the surveys, 'resting(bottling)', 'travelling', and 'hauled-out'. The 'resting("bottling")' (and 'travelling/resting("bottling")') behaviours are specific to the seal species which is displayed when a seal is resting vertically with only the head outside the surface of the water, and the nose pointing at the sky. All three behaviours were exhibited by the harbour seal (*Phoca vitulina*), with the greatest numbers recorded as 'Hauled-out'.

Table 4-3 lists all sightings information, including the time of each sighting and the behaviour recorded.

4.2.3 Incidental Species

A number of bird species were recorded as 'Incidental Species' during the MMO surveys. Photographs of these species were captured where possible and are listed below. Across the 5 survey dates, the following species were recorded:

Figure 4-4Common tern (*Sterna hirundo*) (Figure 4-4)

Black-headed gull (*Chroicocephalus ridibundus*)

Little gull (*Hydrocoloeus minutus*)

Grey heron (*Ardea cinerea*)

Cormorant (*Phalacrocorax carbo*) (Figure 4-6)

Shag (*Phalacrocorax aristotelis*)

Mute swan (*Cygnus olor*)

Great black-backed gull (*Larus marinus*) (Figure 4-5)

Lesser black-blacked gull (*Larus fuscus*)

Oystercatcher (*Haematopus ostralegus*)

Figure 4-4- Common tern (*Sterna hirundo)* foraging within the proposed development area.

Figure 4-5- Great black-backed gull (*Larus marinus*) captured in flight during MMO surveys.

Figure 4-6- A group of cormorants (*Phalacrocorax carbo*) resting on the rocky slope at the edge of the intertidal area.

Table 4-3- List of sightings and all information recorded at time of sighting.

Date	Sighting	Time (start)	Time (end)	Species	Group size	Behaviour	Direction of travel	Tide	Coordinates
22/07/24	1	20:38	20:39	Otter *Lutra lutra*	1	Travelling	W	High	51.836813, -8.3227001
23/07/24	1	12:10	Until 16:00 in same location	Harbour seal *Phoca vitulina*	10	Hauled out	na	Low	51.839099, -8.3301352
23/07/24	2	13:04	13:05	Harbour seal *Phoca vitulina*	1	Bottling	na	Low	51.835499, -8.3283341
23/07/24	3	14:14	14:15	Grey seal *Halichoerus grypus*	1	Travelling	W	Low	51.833484, -8.3263385
23/07/24	4	14:45	14:45	Grey seal *Halichoerus grypus*	1	Travelling	W	Low	51.835459, -8.3255017
30/07/24	1	12:58	13:01	Harbour Seal	1	Travelling	NW	High	51.835539, -8.304202
30/07/2024	1	13:22	13:30	Harbour Seal	1	Travelling	SE	High	51.834591, -8.305515
30/07/24	2	14:40	15:19	Harbour Seal	2	Travelling/Bottling	Back and Forth NW-SE	High	51.835001, -8.304182
30/07/24	2	15:26	15:45	Harbour Seal	2	Hauled out	N/A	High	51.834581, -8.305894
31/07/24	3	09:36	09:42	Harbour Seal	1	Travelling	NW	Low	51.840470, -8.315498
31/07/24	4	10:15	10:16	Harbour Seal	1	Travelling	NW	Low	51.8378583, -8.3110013
01/08/24	5	08:45	12:25	Harbour Seal	13-15	Hauled out	N/A	Low	51.839070, -8.330146
01/08/24	6	08:55	09:01	Harbour Seal	1	Travelling	NW	Low	51.8417429. -8.3200622
01/08/24	6	09:21	09:23	Harbour Seal	1	Travelling	NW	Low	51.8421708, -8.3218150

5. Discussion

There were no limitations on the Marine Mammal Observer surveys undertaken in 2024, weather conditions were ideal and suitable vantage points were selected to provide the best view of the proposed survey area.
The results of the 2013 Marine Mammal Observer survey at the proposed development area noted one juvenile grey seal observed in the water approximately 50m south of Haulbowline Island, one seal (unidentified between grey or harbour) observed hauled out at the breakwater, and three harbour seals observed hauled out at the slip at Haulbowline Island.

The results of the 2024 surveys also reflect the use of the Ringaskiddy port area by both harbour and grey seal, with greater numbers of both recorded in the 2024 surveys than in 2013. This could be due to a greater presence of the species in the area since 2013, or the more favourable weather conditions of the 2024 surveys in comparison to those of 2013.

No cetaceans were observed in the 2024 or 2013 surveys however as noted in 2013, due to the transient nature of the cetacean movement patterns this does not indicate that the area is not visited by dolphins or porpoises. One otter was observed in the 2024 surveys. All seal species are strictly protected under Annex IV and Annex II, V of the Habitats Directive, respectively, and the otter is listed under Annex II of the Habitats Directive.

Comparing the 2013 and 2024 surveys show greater numbers of marine mammals present within the proposed development area. The ideal weather conditions, greater number of survey days, and varying vantage point locations used in the 2024 survey likely contributed to the increase in marine mammal sightings.

6. Conclusion

The 2024 Marine Mammal Observer surveys provide a robust baseline for the assessment of marine mammals present within the proposed development area. Of note, there is a greater number of harbour seal (*Phoca vitulina*) recorded within the area than previously noted in 2013, with the greatest number of species found in one haul-out location adjacent to the port jetty. Grey seal (*Halicheros grypus*) and otter (*Lutra lutra*) were also recorded during the 2024 surveys showing their presence in the proposed development area. Notably, a range of seabirds were recorded as incidental species, indicating the use of the area for foraging and commuting purposes for these species.

7. References

Joint Nature Conservation Committee (2017)-JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys

National Biodiversity Data Centre (NBDC) Map Viewer- Accessed on 19th July 2024, and the 4th of September 2024.

Irish Whale and Dolphin Group (IWDG)-Sightings Database- Accessed on the 4th of September.

AYESA (Port of Cork)

Ringaskiddy Marine Benthic Ecology

AQUAFACT APEM Group

AQUAFACT Ref: P15494

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Reference no: **P15494**

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1	Draft	14/10/2024	Ringaskiddy Marine Ecology Surveys v1	E. McCormack	R. Browne
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1. Introduction

AQUAFACT - APEM Group (hereafter referred to as AQUAFACT) was commissioned by Ayesa on behalf of the Port of Cork Company to conduct marine ecology surveys as part of the preparation of an EIAR chapter on Marine Ecology for proposed developments at Ringaskiddy, Co. Cork.

Under the EU's Environmental Impact Assessment (EIA) Directive (2011/92/EU as amended by 2014/52/EU), major building or development projects in the EU must first be assessed for their impact on the environment. The proposed development site ("the Site") is located at the Port of Cork, Ringaskiddy, Co. Cork. The Site is centred at approximate Irish Transverse Mercator (ITM) coordinates 706992, 735455 and is *ca*. 0.4ha.

This intertidal and subtidal study focuses on the maritime area near the proposed redevelopment of Ringaskiddy. The Port of Cork Company (POCC) has completed major redevelopment at Ringaskiddy under the permitted Strategic Infrastructure Development (PA0035, with modifications). The main elements of these works are operational, but further permission is needed to complete remaining works due to EIA and AA requirements.

The remaining redevelopment at Ringaskiddy involves several key construction elements across multiple sites and are summarised below (also see redline boundaries Figure 1-1).

Ringaskiddy East (Container and Multi-purpose Berth (CB/MPB)):

- A Container Berth of approximately 200m in length (CCT 2)
- Dredging of the seabed to a level of -13.0 m Chart Datum (CD)
- Installation of link-span comprising a floating pontoon and access bridge
- Installation of container handling cranes
- Lighting and fencing

Ringaskiddy West (Deepwater Berth Extension):

- A new 182m extension to the existing Deepwater Berth (DWB) which will comprise a filled quay structure (of approximately 231m) extending no further seaward than the edge of the existing DWB
- Dredging works to varying levels to facilitate navigational access to the new facilities
- Lighting

Road Improvements:

Improvements to internal road network at Ringaskiddy East to facilitate future access to the N28

Lighting and fencing

The redevelopment also features Load on Load off (LoLo), Roll on and Roll off (RoRo), and general cargo operations, with specific quay structures, surfacing, and reclamation works. Key services such as drainage, lighting, and security systems will be installed to ensure the safe and efficient operation of the terminal.

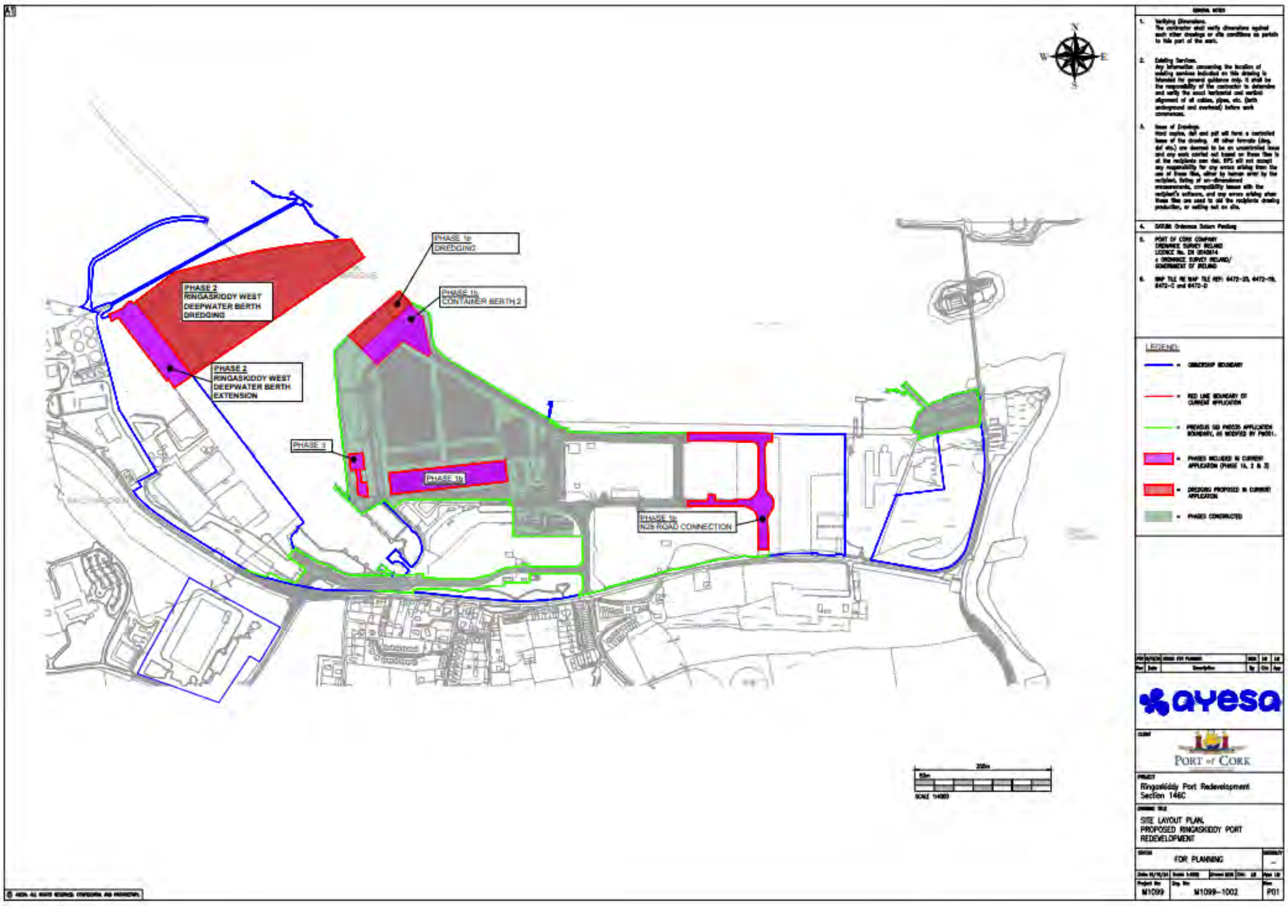

Figure 1-1: Ringaskiddy development site

2. Materials & Methods

2.1 Subtidal Benthic Grab Survey

The subtidal benthic grab survey took place on the 23rd of July 2024 using a 0.1m^2 Day Grab on board the Port of Cork vessel the *Denis Murphy.* Figure 2.1 shows the locations of the subtidal and intertidal sample stations at Ringaskiddy.

Figure 2-1: Subtidal and Intertidal Survey Stations at Ringaskiddy

Table 2-1: 2024 Subtidal station coordinates.

Station	Latitude	Longitude
St. 1	51.83631	-8.32391
St. 2	51.83482	-8.32446
St. 3	51.83272	-8.32401
St. 4	51.83137	-8.32383
St. 5	51.83165	-8.3256
St. 6	51.83686	-8.33259
St. 7	51.83757	-8.33111
St. 8	51.83817	-8.32495
St. 9	51.8351	-8.32715
St. 10	51.838	-8.32422
St. 11	51.83951	-8.32159
St. 12	51.83706	-8.32204
St. 13	51.83753	-8.32155
St. 14	51.83817	-8.32097

2.1.1 Biological Sampling

AQUAFACT has in-house standard operational procedures for benthic sampling, and these were followed for this project. Additionally, AQUAFACT follows the NMBAQC standard for benthic sampling and analysis (Worsfold *et al.,* 2010). The subtidal biological samples were collected using a 0.1m^2 Day grab sampler at 14 stations listed in Table 2.1 above. On arrival at each sampling station, the vessel location was recorded using DGPS (Lat/Long & ING). A total of 14 sites were sampled, with 1 faunal grab and 1 sediment grab collected at each station. The grab failed to recover a sufficient sample for station 12 after three attempts and accordingly this station was abandoned. Only one grab was conducted for both station 04 and station 05 due to the proximity of these stations to the quay walls and the difficulty in manoeuvring the *Denis Murphy* in this area. For each of these stations the sediment sample for organic carbon analysis and sample for fauna analysis were taken from the same grab sample. The grab deployment and recovery rates did not exceed 1 metre/sec and were <0.5 m/sec for the last 5 metres for water depths up to 30m and for the last 10m for depths greater than 30m.

A digital image of each sample (including the sample label) was taken, and its reference number was entered in the sample data sheet. These images can be made available on request. The grab sampler was cleaned between stations to prevent cross contamination.

Each grab sample was carefully and gently sieved on a 1mm mesh sieve as a sediment water suspension for the retention of fauna. Great care was taken during the sieving process in order to minimise damage to taxa such as spionids, scale worms, phyllodocids and amphipods. The sample residue was carefully flushed into a pre-labelled (internally and externally) container from below. Each label contained the sample code and date. The samples were stained immediately with Eosin-briebrich scarlet and fixed with 4% w/v buffered formaldehyde solution (10% w/v buffered formaldehyde solution for very organic mud).

All grab returns were sieved on a 1mm mesh sieve and fixed in 6% w/v buffered formalin solution upon returning to the laboratory (within 24 hours).

An additional grab sample was collected at each station for sediment analysis (organic carbon and granulometry). Each sediment sample was placed in plastic sampling bags and labelled internally and externally. These samples were frozen (<-18ºC) as soon as possible after acquisition.

2.2 Intertidal Grab Survey

The Phase I walkover survey of the two intertidal transect locations took place at low tide on the 24th of July 2024. Initially it was planned to carry out the Phase II quantitative transect survey on foot to take core samples from the littoral zone. A dynamic risk assessment was carried out on site, and it was determined that the sediment type was not suitable to traverse across on foot and alternatively a decision was made to achieve the required sampling from a suitable vessel at high tide using a $0.25m^2$ van Veen grab sampler. Grab sampling took place on the 12th of September 2024 on board the *Oisre.* A total of 6 stations were sampled along 2 transects, with 1 fauna sample and 1 sediment sample collected at each station. Footage of the sample area was captured using a drop-down video at each transect. Additionally, images of the shoreline were captured by the survey team during the first intertidal survey attempt on the 24th of July 2024. Figure 2.2 below shows the locations of the subtidal and intertidal sample stations at Ringaskiddy.

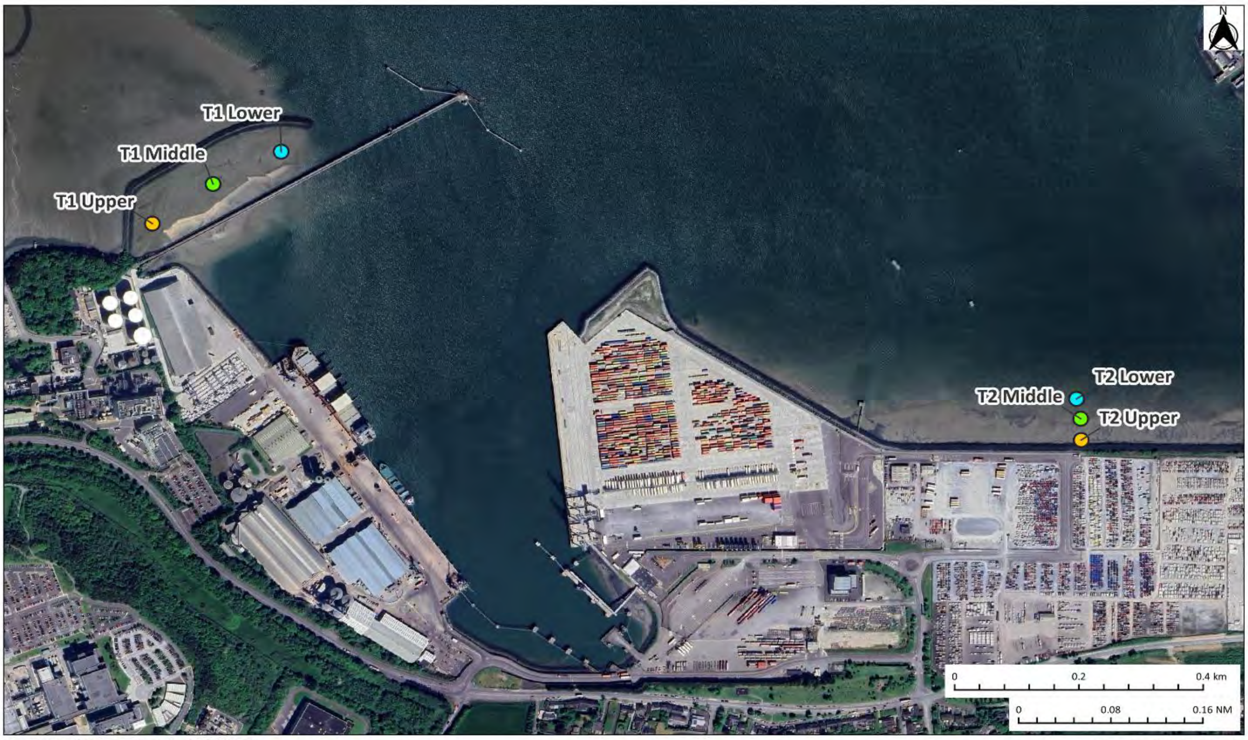

Figure 2-2: Locations of Ringaskiddy intertidal transect

Table 2-2: 2024 Intertidal station coordinates

Station	Latitude	Longitude
T1 Upp	51.8376	-8.3338
T1 Mid	51.83821	-8.33239
T1 Lwr	51.8387	-8.3308
T2 Upp	51.83438	-8.31209
T2 Mid	51.8347	-8.3121
T2 Lwr	51.835	-8.3122

2.2.1 Biological sampling

As the intertidal area at both transects was of soft thick mud, it was determined after a couple of attempts that it would not be safe to sample the intertidal from the shore. Instead, the decision as discussed above was taken to survey the transects at highwater from a Rigid Inflatable Boat (RIB) using a small van Veen grab (0.025 m^2) of the same volume as the intertidal cores. Triplicate cores were collected at each shore height (upper, middle, and lower) with an additional grab collected for sediment analysis. On arrival at each sampling station, the vessel location was recorded using DGPS (Lat/Long & ING). A digital image of each sample (including sample label) was taken and its reference number entered in the sample data sheet. These images can be made available on request. The grab sampler was cleaned between stations to prevent cross contamination.

Each sample was sieved and preserved upon return to the lab in the manner outlined for the subtidal grab samples.

2.3 Lab Analysis

2.3.1 Sample Processing

All faunal samples were placed in an illuminated shallow white tray and sorted first by eye to remove large specimens and then sorted under a stereo microscope (x 10 magnification). Following the removal of larger specimens, the samples were placed into Petri dishes, approximately one-half teaspoon at a time and sorted using a binocular microscope at x25 magnification.

The faunal samples were sorted into four main groups: Annelida, Mollusca, Arthropoda, and others. The 'others' group consisted of echinoderms, nematodes, nemerteans, cnidarians, and other lesser phyla. The fauna were maintained in stabilised 70% industrial methylated spirit (IMS) following retrieval and identified to species level where practical using a binocular microscope, a compound microscope and all relevant taxonomic keys. After identification and enumeration, specimens were pooled and stored station level.

2.3.2 Sediment Sampling

For the sediment samples, a sample was retrieved from the grab for granulometric analysis. A further sediment subsample was retrieved from the grab for loss on ignition (LOI) organic carbon content analysis. The samples were placed in plastic sampling bags and labelled internally and externally. These samples were frozen (<-18ºC) as soon as possible after acquisition. AQUAFACT carried out the sediment PSA (as described in Section 2.3.2.1 below) while sediment LOI organic carbon content analysis was carried out by the ALS Ltd. Laboratories, Co. Galway, using the Loss on Ignition technique (see Section 2.1.3.2 below for further details).

2.3.2.1 Particle Size Analysis

AQUAFACT carried out the PSA analysis in-house using the following methodology:

1. Approximately 100g of dried sediment (previously washed in distilled water and dried) was weighed out and placed in a labelled 1L glass beaker to which 100ml of a 6 percent hydrogen peroxide solution was added. This was allowed to stand overnight in a fume hood.
2. The beaker was placed on a hot plate and heated gently. Small quantities of hydrogen peroxide were added to the beaker until there was no further reaction. This peroxide treatment removed any organic material from the sediment which can interfere with grain size determination.

3. The beaker was then emptied of sediment and rinsed into a 63µm sieve. This was then washed with distilled water to remove any residual hydrogen peroxide. The sample retained on the sieve was then carefully washed back into the glass beaker up to a volume of approximately 250ml of distilled water.
4. 10ml of sodium hexametaphosphate solution was added to the beaker and this solution was stirred for ten minutes and then allowed to stand overnight. This treatment helped to dissociate the clay particles from one another.
5. The beaker with the sediment and sodium hexametaphosphate solution was washed and rinsed into a 63µm sieve. The retained sample was carefully washed from the sieve into a labelled aluminium tray and placed in an oven for drying at 100ºC for 24 hours.
6. The dried sediment was then passed through a Wentworth series of analytical sieves (>8,000 to 63µm; single phi units). The weight of material retained in each sieve was weighed and recorded. The material which passed through the 63µm sieve was also weighed and the value added to the value measured in Point 5 (above).
7. The total silt/clay fraction was determined by subtracting all weighed fractions from the initial starting weight of sediment as the less than 63µm fraction was lost during the various washing stages.
8. The following range of particle sizes were reported.: <63 m, >63 - <125 m, >125 - <250 m, >250 <500 m, >500 - <1000 m, >1000 - <2000 m, >2000 - <4000 m and >4000 - <8000 m.

Table 2.3 shows the classification of sediment particle size ranges into size classes. Sieves, which corresponded to the range of particle sizes were used in the analysis.

Table 2-3: The classification of sediment particle size ranges into size classes (adapted from Buchanan, 1984).

Range of Particle Size	Classification	Phi Unit
<63µm	Silt/Clay	>4 Ø
63-125 µm	Very Fine Sand	4 Ø, 3.5 Ø
125-250 µm	Fine Sand	3 Ø, 2.5 Ø
250-500 µm	Medium Sand	2 Ø, 1.5 Ø
500-1000 µm	Coarse Sand	1 Ø, 1.5 Ø
1000-2000 µm (1 – 2mm)	Very Coarse Sand	0 Ø, -0.5 Ø
2000 – 4000 µm (2 – 4mm)	Very Fine Gravel	-1 Ø, -1.5 Ø
4000 -8000 µm (4 – 8mm)	Fine Gravel	-2 Ø, -2.5 Ø
8 -64 mm	Medium, Coarse & Very Coarse Gravel	-3 Ø to -5.5 Ø
64 – 256 mm	Cobble	-6 Ø to -7.5 Ø
>256 mm	Boulder	< -8 Ø

2.3.2.2 Loss on Ignition Organic Carbon Analysis

The methodology outlined below was followed.

1. The collected sediments should be transferred to aluminium trays, homogenised by hand and dried in an oven at 100º C for 24 hours.
2. A sample of dried sediment should be placed in a mortar and pestle and ground down to a fine powder.
3. 1g of this ground sediment should be weighed into a pre-weighed crucible and placed in a muffle furnace at 450ºC for a period of 6 hours.
4. The sediment samples should be then allowed to cool in a desiccator for 1 hour before being weighed again.
5. The LOI organic content of the sample is determined by expressing as a percentage of the weight of the sediment after ignition over the initial weight of the sediment.

2.4 Data Analysis

2.4.1 Sediment Data

Organic content of sediment samples was determined for each sample by expressing it as a percentage the sediment weight loss following combustion over the initial weight of the sediment. In general, Loss Of carbon Ignition (LOI) correlates with sediment particle size with fine-grained sediments typically containing higher levels of organic matter than coarse sediments.

For the granulometric analysis of sediment samples, the <63 µm (Silt-Clay) fraction was determined by weight loss following wet sieving. Coarser fractions comprising the sediment samples were determined by mechanical dry sieving through a series of Wentworth sieves; >4mm (Fine Gravel), 2-4mm (Very Fine Gravel), 1-2mm (Very Coarse Sand), 0.5-1mm (Coarse Sand), 0.25-0.5mm (Medium Sand), 125-250µm (Fine Sand), 62.5-125µm (Very Fine Sand). For each station, the weight of each fraction of the sediment retained on the sieve was expressed as a percentage of the total sample. The relative proportion of sediments in each fraction was used to classify sediments at the station *sensu* Folk (1954).

2.4.2 Faunal Data

Uni- and multi-variate statistical analysis of the faunal data was undertaken using PRIMER v.6 (Plymouth Routines in Ecological Research).

2.4.2.1 Univariate Indices

Using PRIMER the faunal data was used to produce a range of univariate indices. Univariate indices are designed to condense species data in a sample into a single coefficient that provides quantitative estimates of biological variability (Heip *et al*., 1998; Clarke and Warwick, 2001). Univariate indices can be categorised as primary or derived indices.

Primary biological indices used in the current study include:

- number of taxa (S) in the samples and
- number of individuals (N) in the samples.

Derived biological indices, which are calculated based on the relative abundance of species in samples, used in the study include:

- Margalef's species richness index (D) (Margalef, 1958),

$$D \quad \frac{S \quad 1}{\log_2 N}$$

where: N is the number of individuals and S is the number of species

Margalef's species richness (D) is a measure of the total number of species present for a given number of individuals.

- Pielou's Evenness index (J) (Pielou, 1977)

$$J = \frac{H'(\text{observed})}{H'_{max}}$$

where: H'_{max} is the maximum possible diversity, which could be achieved if all species were equally abundant (= $\log_2 S$)

Pielou's evenness is a measure of how evenly the individuals are distributed among different species.

- Shannon-Wiener diversity index (H') (Pielou, 1977)

$$H' = - \sum_{i=1}^{S} p_i(\log_2 p_i)$$

where: p_I is the proportion of the total count accounted for by the i^{th} taxa

Shannon-Wiener diversity index takes both species abundance and species richness into account quantify diversity (Shannon & Wiener, 1949).

- Simpson's Diversity Index (Simpson, 1949)

$$1\text{-}\lambda' = 1\text{-}\{\Sigma_i N_i(N_i\text{-}1)\} / \{N(N\text{-}1)\}$$

where N is the number of individuals of species i.

- The Shannon-Wiener based Effective Number of Species (ENS) (Hill, 1973; Jost, 2006)

$$H = \exp(H')$$

where H' is the Shannon-Wiener diversity index.

The Shannon-Wiener index diversity index is converted to ENS to reflect 'true diversities' (Hill, 1973, Jost, 2006) that can then be compared across communities (MacArthur, 1965; Jost, 2006). The ENS is equivalent to the number of equally abundant species that would be needed in each sample to give the same value of a diversity index, *i.e.,* Shannon-Wiener Diversity index. The ENS behaves as one might? intuitively expect when diversity is doubled or halved, while other standard indices of diversity do not (Jost, 2006). If the ENS of one community is twice that of another, then it can be said that the community is twice as diverse as the other.

2.4.2.2 Multivariate Analysis

The PRIMER programme (Clarke & Warwick, 2001) was used to carry out multivariate analyses on the station-by-station faunal data. All species abundance data from the grab surveys was square root transformed and used to prepare a Bray-Curtis similarity matrix in PRIMER. The square root transformation allows some of the less abundant species to play a part in the similarity calculation. Various ordination and clustering techniques can then be applied to the similarity matrix to determine the relationship between the samples.

Multidimensional scaling (MDS) is a technique that ordinates samples as points in 2D or 3D space based on similarity in species distribution data. MDS performed on the Bray-Curtis similarity matrix produce ordination maps whereby the placement of samples reflects the similarity of their biological communities, rather than their simple geographical location (Clarke & Warwick, 2001).

An indication of how well the similarity matrix is represented by the ordination is given by stress values calculated by comparing the interpoint distances in the similarity matrix with the corresponding interpoint distances on the ordinations. Perfect or near perfect matches are rare in field data, especially in the absence of a single overriding forcing factor such as an organic enrichment gradient. Stress values increase, not only with the reducing dimensionality (lack of clear forcing structure), but also with increasing quantity of data (it is a sum of the squares type regression coefficient). Clarke & Warwick (2001) have provided a classification of the reliability of MDS plots based on stress values, having compiled simulation studies of stress value behaviour and archived empirical data. This classification generally holds well for ordinations of the type used in this study. Their classification is given below:

Stress value < 0.05: Excellent representation of the data with no prospect of misinterpretation.

Stress value < 0.10: Good representation, no real prospect of misinterpretation overall structure, but very fine detail may be misleading in compact subgroups.

Stress value < 0.20: This provides a useful picture, but detail may be misinterpreted, particularly nearing 0.20.

Stress value 0.20 to 0.30: This should be viewed with scepticism, particularly in the upper part of the range, and discarded for a small to moderate number of points such as < 50.

Stress values > 0.30: The data points are close to being randomly distributed in the ordination and not representative of the underlying similarity matrix.

Each stress value must be interpreted both in terms of its absolute value and the number of data points. In the case of this study, the moderate number of data points indicates that the stress value can be interpreted more or less directly. While the above classification is arbitrary, it does provide a framework that has proved effective in this type of analysis.

Hierarchical Agglomerative Clustering (HAC) is used to cluster samples based on between-sample similarities into groups in dendrograms. Similarity Profiling (SIMPROF) is used to test if differences between HAC derived similarity-based clusters are significant. Similarity Percentages (SIMPER) analysis can be used to determine the characterising species of each cluster of stations identified either arbitrarily (by eye) from HAC dendrograms or statistically using SIMPROF testing (Clarke and Warwick, 2001; Clarke and Gorley, 2006; Anderson *et al*., 2008).

The species, which are responsible for the grouping of samples in CLUSTER analyses, were identified using the PRIMER programme SIMPER (Clarke & Warwick, 1994). This programme determined the percentage contribution of each species to the dissimilarity/similarity within and between each sample group.

3. Results

3.1 Subtidal Faunal Results

The taxonomic identification of the benthic infauna across all 13 subtidal benthic stations surveyed at Ringaskiddy yielded a total count of 99 taxa, comprising 1,918 individuals ascribed to 8 phyla. Of the 99 taxa identified, 64 were identified to species level. The remaining 34 could not be identified to species level because they were juveniles, damaged, or indeterminate. The full faunal abundance species list can be seen in Appendix 1. Station 12 could not be sampled as the substrate was of large boulders.

Of the 99 taxa recorded, 2 were cnidarians (anemones, hydroids *etc.*), 1 was a nemertean (ribbon worm), 1 was a nematode (round worm), 29 were annelids (segmented worms), 38 were arthropods (crabs, shrimps, insects *etc*.), 24 were molluscs (mussels, cockles, snails etc.), 1 was a bryozoan (moss animal), and 3 were echinoderms (brittlestars, sea cucumbers *etc.*).

Four taxa accounted for over 55% of the faunal abundance: the bivalve Mytilidae juvenile (319 individuals, 16.63% abundance) and the polychaetes *Melinna palmata* (292 individuals, 15.22% abundance), *Nephtys* spp (damaged) (229 individuals, 11.94% abundance), and Ampharetidae (damaged) (222 individuals, 11.54% abundance).

3.1.1 Subtidal Univariate Analysis

Univariate statistical analyses were carried out on the station-by-station faunal data. As the same survey method and replication were used in both the intertidal and subtidal survey, all data was analysed together. The following parameters were calculated and can be seen in Table 3.1; Total Number of Taxa, Total number of Individuals, Richness, evenness, Shannon-Wiener diversity, Effective Number of Species (ENS), and Simpson's Diversity. Number of taxa ranged from 4 (St. 6 & St. 7) to 46 (St. 14). Number of individuals ranged from 22 (St. 6 & St. 7) to 401 (St. 13). Richness ranged from 0.97 (St. 6 & St. 7) to 8.05 (St. 14). Evenness ranged from 0.6 (St. 2) to 0.88 (St. 10). Shannon-Wiener diversity ranged from 0.55 (St. 7) to 2.96 (St. 11). Simpson's diversity ranged from 0.26 (St.7) to 0.93 (St. 10). Effective number of species ranged from 1.73 (St. 7) to 19.34 (St. 11), indicating that station St. 11 is over 11 times more diverse than St. 7. Figure 3.1 shows these community indices in graphical form.

Table 3-1: Univariate measures of community structure.

Station	No. Taxa	No. Individuals	Richness	Evenness	Shannon-Wiener Diversity	Effective Number of Species	Simpson's Diversity
	S	N	d	J'	H'(loge)	EXP(H')	1-Lambda
St1	31	131	6.15	0.84	2.89	17.97	0.92
St2	17	245	2.91	0.60	1.69	5.41	0.73
St3	16	121	3.13	0.70	1.95	7.03	0.81
St4	6	35	1.41	0.64	1.14	3.14	0.57
St5	7	30	1.76	0.80	1.56	4.77	0.77
St6	4	22	0.97	0.79	1.10	3.00	0.64
St7	4	22	0.97	0.40	0.55	1.73	0.26
St8	39	218	7.06	0.61	2.25	9.51	0.73
St9	8	195	1.33	0.64	1.33	3.80	0.61
St10	28	90	6.00	0.88	2.94	18.83	0.93
St11	37	141	7.27	0.82	2.96	19.34	0.91
St13	42	401	6.84	0.67	2.49	12.12	0.83
St14	46	267	8.05	0.72	2.75	15.67	0.86

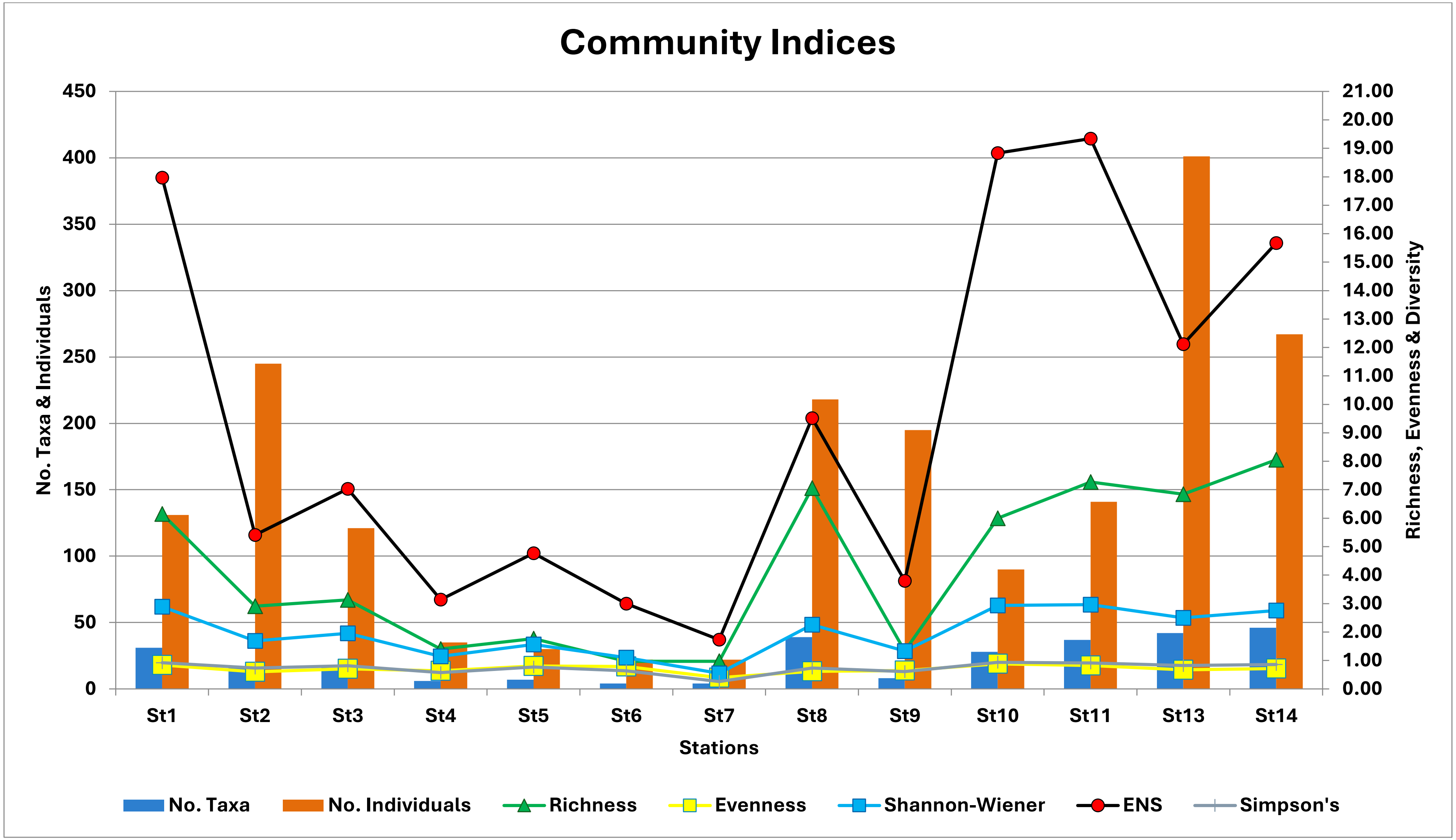

Figure 3-1: Subtidal community diversity indices. Diversity is expressed in Effective Number of Species (ENS), Shannon-Wiener Diversity index, and Simpson's Diversity index.

3.1.2 Subtidal Multivariate Analysis

The same data set used above for the univariate analyses was also used for the multivariate analyses. The dendrogram and the MDS plot can be seen in Figures 3.2 and 3.3, respectively. SIMPROF analysis revealed 4 statistically significant groupings between the 13 stations (the samples connected by red lines cannot be significantly differentiated). The stress level on the MDS plot indicates a good representation of the data with no real prospect of misinterpretation of the overall structure, but very fine detail may be misleading in compact subgroups.

A clear divide (79.95% dissimilarity) can be seen between **Group a** within the inner Ringaskiddy harbour area and those outside (**Groups b**, **c**, and **d**).

Group a consisted of stations St.2, St.3, St.4, St.5, St.6, St.7, and St.9. This group separated from all the other groups at a 79.95% dissimilarity level. Group a had a 46.89% within group similarity. This group contained 29 taxa comprising 670 individuals. Of the 29 taxa, 20 of the taxa were present twice or less. Six taxa accounted for over 93% of the faunal abundance: the molluscs Mytilidae (juvenile) (282 individuals, 42.09% abundance), *Peringia ulvae* (65 individuals, 9.7% abundance), and *Abra nitida* (53 individuals, 7.91% abundance) and the polychaetes *Nephtys* spp. (damaged) (133 individuals, 19.85% abundance), Ampharetidae (damaged) (52 individuals, 7.76% abundance), and *Nephtys hombergii* (38 individuals, 5.67% abundance). SIMPER analysis revealed the same taxa as characterising for this group. *Nephtys* spp. and *Nephtys hombergii* indifferent to enrichment and are typically present in low densities with non-significant variations over time. Mytilidae (juvenile *Mytilus edulis*), *Peringia ulvae,* and *Abra nitida* are tolerant of disturbance, occurring under normal conditions, but their populations are stimulated by organic enrichment. Group a stations exhibit elements of the JNCC biotopes ‘SS.SMu.IFIMu.CerAnit *Cerastoderma edule* with *Abra nitida* in infralittoral mud’ (EUNIS code A5.341) (Tillin & Tyler-Walters, 2016) and ‘SS.SSa.IMuSa.SsubNhom *Spisula subtruncata* and *Nephtys hombergii* in shallow muddy sand’ (EUNIS code A5.244) (Tillin, 2016).

Group b consisted of one station, St. 11. This group separated from Groups c and d at 60.96% dissimilarity level. Group b contained 37 taxa comprising 141 individuals. Of the 37 taxa, 23 were present twice or less. Six taxa accounted for almost 57% of the faunal abundance: the polychaetes *Melinna palmata* (35 individuals, 24.82% abundance), *Galathowenia oculata* (10 individuals, 7.09% abundance) *Lumbrineris cingulata* aggregate (6 individuals, 4.26% abundance), the crustaceans *Bodotria scorpioides* (12 individuals, 8.51% abundance) and *Euphilomedes sinister* (10 individuals, 7.09% abundance) and the bivalves Mytilidae (juvenile) (7 individuals, 4.96% abundance. SIMPER analysis could not be carried out as the groups contained only one station. *Bodotria scorpioides* is indifferent to enrichment and is typically present in low densities with non-significant variations over time. *Melinna palmata, Galathowenia oculata,* Mytilidae (juvenile *Mytilus edulis*), and *Lumbrineris cingulata* aggregate are tolerant of disturbance, occurring under normal conditions, but their populations are stimulated by organic enrichment. Group b can be classified as belonging to the JNCC biotope 'SS.SMu.ISaMu.MelMagThy *Melinna palmata* with *Magelona* spp. and *Thyasira* spp. in infralittoral sandy mud' (EUNIS code A5.334) (De-Bastos, 2016).

Group c contained stations St. 13 and St 14. This group separated from Group d at a 56.57% dissimilarity level and had a within group similarity of 61.78%. This group contained 60 taxa comprising 668 individuals. Of the 60 taxa, 36 were present twice or less. Nine species accounted for over 74% of the faunal abundance: the polychaetes Ampharetidae (damaged) (157 individuals, 23.5% abundance), *Melinna palmata* (119 individuals, 17.81% abundance), *Nephtys* spp. (damaged) (57 individuals, 8.53% abundance), and *Ampharete lindstroemi* aggregate (25 individuals, 3.74% abundance), the amphipod *Ampelisca tenuicornis* (48 individuals, 7.19% abundance), the bivalves *Abra nitida* (29 individuals, 4.34% abundance) and Mytilidae (juvenile *Mytilus edulis*) (22 individuals, 3.29% abundance), and the gastropods *Tragula fenestrata* (21 individuals, 3.14% abundance) and *Odostomia unidentata* (20 individuals, 2.99% abundance). SIMPER analysis could not be carried out as the group only contained 2 stations. *Ampelisca tenuicornis* are very sensitive to organic enrichment and are present in unpolluted conditions. *Nephtys* spp., *Tragula fenestrata,* and *Odostomia unidentata* are indifferent to enrichment and are typically present in low densities with non-significant variations over time. *Melinna palmata, Abra nitida,* and *Ampharete lindstroemi* aggregate are tolerant of disturbance, occurring under normal conditions, but their populations are stimulated by organic enrichment. Group c can be classified as belonging to the JNCC biotope 'SS.SMu.ISaMu.MelMagThy *Melinna palmata* with *Magelona* spp. and *Thyasira* spp. in infralittoral sandy mud' (EUNIS code A5.334) (De-Bastos, 2016).

Group d contained stations St. 1, St. 8, and St 10. This group separated from Group c at a 56.57% dissimilarity level and had a within group similarity of 51.71%. This group contained 59 taxa comprising 439 individuals. Of the 59 taxa, 33 were present twice or less. Seven species accounted for over 61% of the faunal abundance: the polychaetes *Melinna palmata* (137 individuals, 31.21% abundance), *Nephtys* spp. (damaged) (34 individuals, 7.74% abundance), *Notomastus* sp. (32 individuals, 7.29% abundance), and *Phyllodoce mucosa* (12 individuals, 2.73% abundance) the amphipod *Ampelisca* sp. (damaged) (26 individuals, 5.92% abundance), the cumacean *Bodotria scorpioides* (14 individuals, 3.19% abundance), and the gastropod *Peringia ulvae* (14 individuals, 3.19% abundance). SIMPER analysis further revealed the bivalves Veneridae (juvenile), *Kurtiella bidentata,* and *Cerastoderma edule*, and the holothurian *Paraleptopentacta elongata* as characterising taxa of this group. *Ampelisca* spp. are very sensitive to organic enrichment and are present in unpolluted conditions. *Nephtys* spp. and *Bodotria scorpioides* are indifferent to enrichment and are typically present in low densities with non-significant variations over time. *Melinna palmata, Notomastus, Peringia ulvae,* and *Phyllodoce mucosa* are tolerant of disturbance, occurring under normal conditions, but their populations are stimulated by organic enrichment. Group d can also be classified as belonging to the JNCC biotope SS.SMu.ISaMu.MelMagThy *Melinna palmata* with *Magelona* spp. and *Thyasira* spp. in infralittoral sandy mud (EUNIS code A5.334).

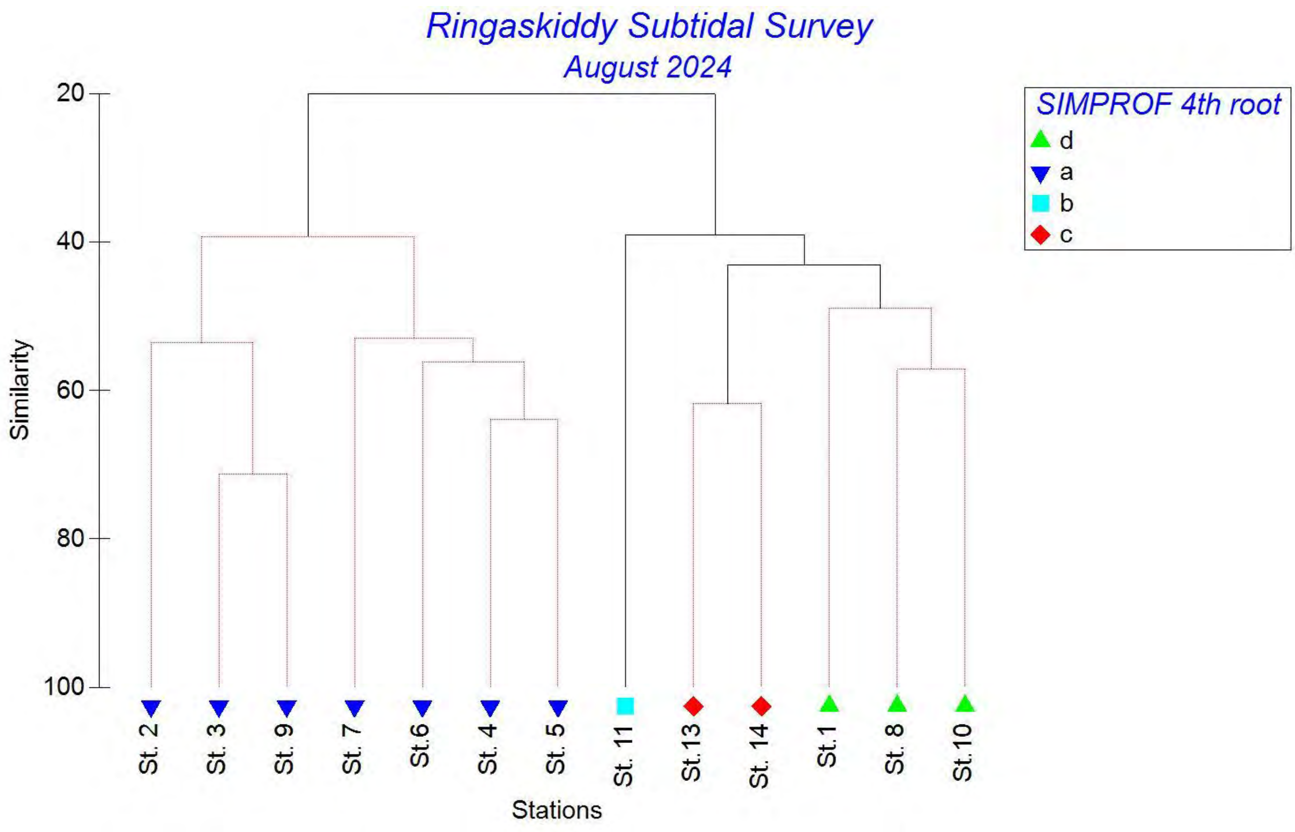

Figure 3-2: Dendrogram produced from Cluster analysis of the subtidal data.

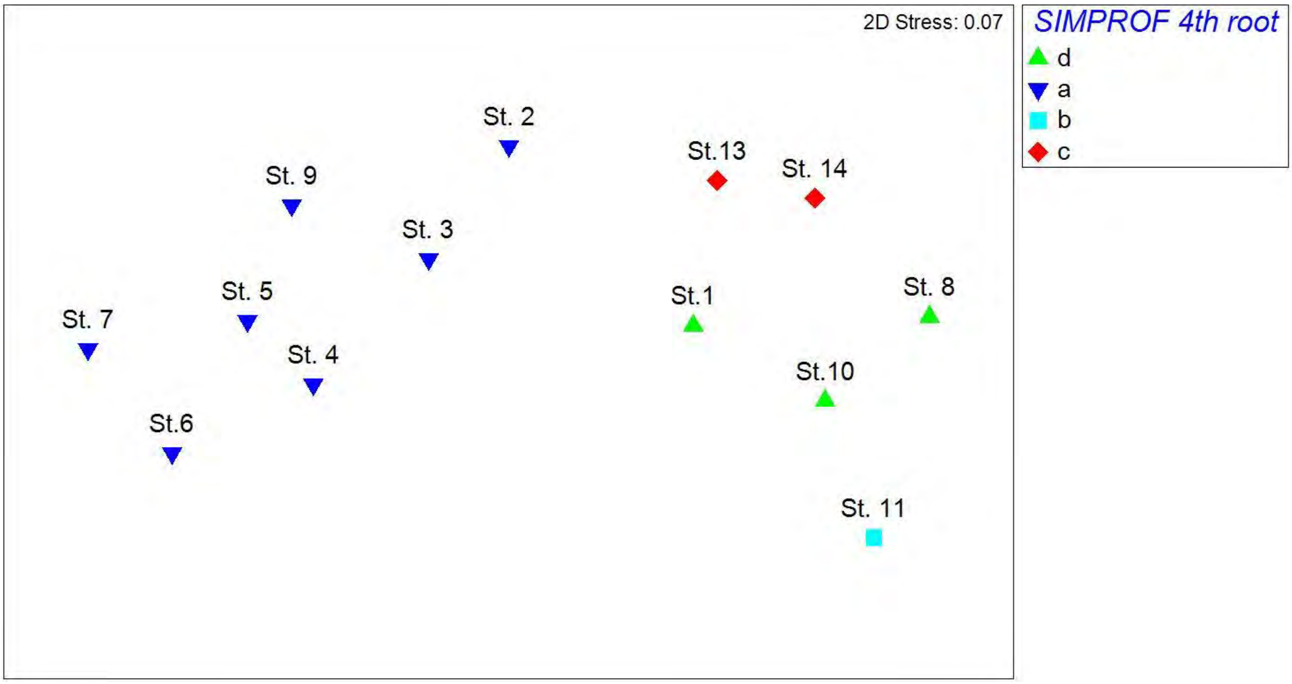

Figure 3-3: MDS Plot of the subtidal data.

3.1 Intertidal Walkover Survey

Walkover surveys of the upper shore areas of Transect 1 and Transect 2 revealed sloped rock armour boulders leading onto a shore of thick fine mud. As outlined above, attempts to retrieve cores along the upper, middle, and lower shores proved a safety risk and an alternative method of sampling from a RIB at highwater was employed. The results of the intertidal faunal grab survey are presented in section 3.3 below.

3.1.1 Transect 1 location

Transect 1 was previously surveyed in 2014. This location is situated to the south of the training wall and north of the ADM jetty. Figure 3.4. illustrates the locations of the intertidal faunal grab stations. The upper shore rock armour along the training wall has a zonation typical of hard substrates in this sheltered muddy mid estuarine location. Figure 3.5 illustrates this zonation adjacent to the intersection of the training wall and the jetty. Sloping stable boulders in the supralittoral has a community of yellow and grey lichens including *Xanthoria parietina, Caloplaca marina*, and *Hydropunctaria maura* (formerly *Verrucaria maura*). This can be classified as the JNCC biotope 'LR.FLR.Lic.YG – Yellow and grey lichens on supralittoral rock' (EUNIS code B3.111) (Tyler-Walters, 2016). This band transitions into a narrow upper rocky shore biotope characterised by *Pelvetia canaliculata* and *Fucus spiralis* ('LR.LLR.F.Fspi – *Fucus spiralis* on sheltered upper eulittoral rock' (EUNIS code A1.312)(Perry, 2015)). This biotope then transitions into a band dominated by *Ascophylum nodosum* and *Vertebrata lanosa* with some *Ulva* spp. ('LR.LLR.F.Asc.FS – *Ascophyllum nodosum* on full salinity mid eulittoral rock' (EUNIS code A1.3141)(Perry & Hill, 2020)).

Beneath the ADM jetty there is an extensive area of mussel bed that was previously recorded in the 2008 and 2014 surveys and remains relatively unchanged since the last surveys. This mussed bed can be seen in Figure 3.6 and it can be classified as 'LS.LBR.LMus.Myt.Mu - *Mytilus edulis* beds on littoral mud' (EUNIS code A2.7213)(Tillin & Mainwaring, 2018).

Figure 3-4: Intertidal Transect 1 station locations.

Figure 3-5: Rock armour zonation in upper shore along Transect 1.

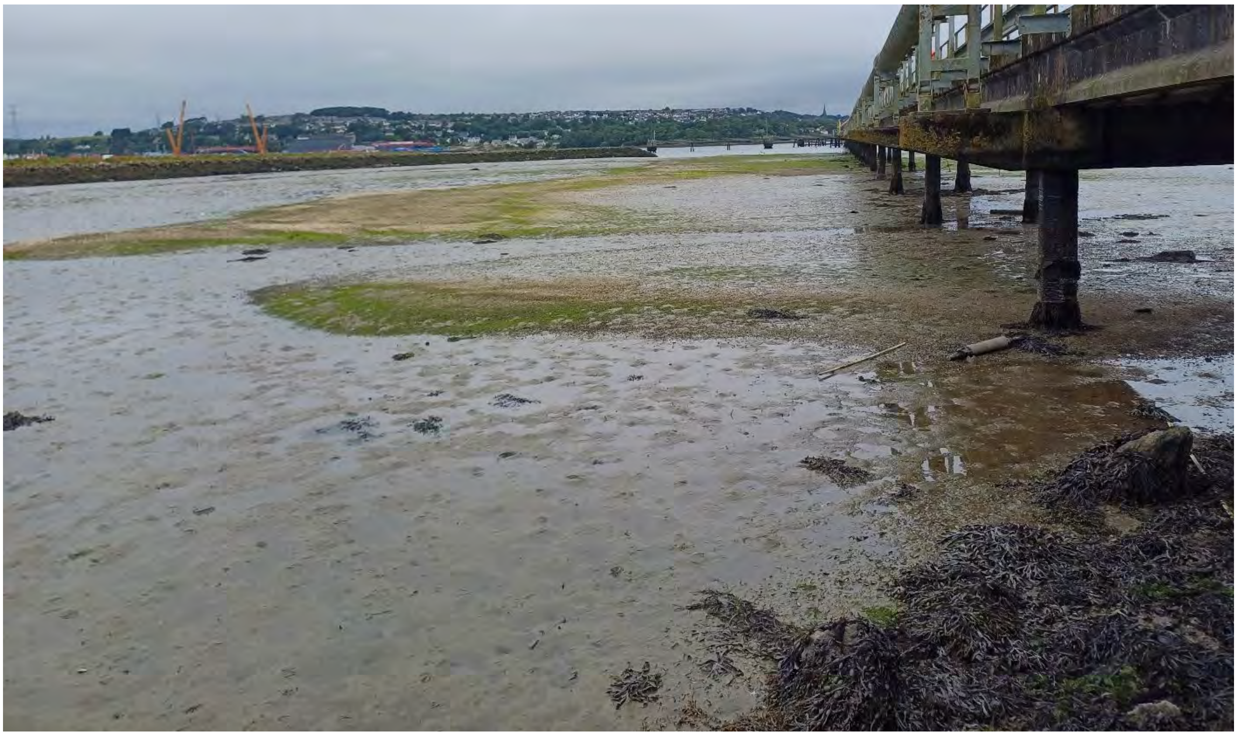

Figure 3-6: Transect 1 Intertidal mussel beds beneath ADM Jetty.

3.1.2 Transect 2 location

Transect 2 was not surveyed previously. This transect is located along the quay wall to the east of the proposed 160m quay wall extension and to the west of the bridge at Paddy's Point. The location was chosen as a representative intertidal location downstream from the proposed extension and likely to be influenced by the proposed works. Figure 3.7. illustrates the locations of the intertidal faunal grab stations. The upper shore rock armour along the quay wall is similar to Transect 1. Figure 3.8 illustrates this zonation. Sloping stable boulders in the supralittoral has a community of yellow and grey lichens including *Xanthoria parietina, Caloplaca marina*, and *Hydropunctaria maura* (formerly *Verrucaria maura*). ('LR.FLR.Lic.YG – Yellow and grey lichens on supralittoral rock' (EUNIS code B3.111). This band transitions into a narrow upper rocky shore biotope characterised by *Pelvetia canaliculata* and *Fucus spiralis* ('LR.LLR.F.Fspi – *Fucus spiralis* on sheltered upper eulittoral rock' (EUNIS code A1.312)). This biotope then transitions into a band dominated by *Ascophylum nodosum* and *Vertebrata lanosa* with some *Ulva* spp. ('LR.LLR.F.Asc.FS – *Ascophyllum nodosum* on full salinity mid eulittoral rock' (EUNIS code A1.3141)).

Figure 3-7: Transect 2 station locations.

Figure 3-8: Rock armour zonation in upper shore along Transect 2.

3.2 Intertidal Faunal Results

The taxonomic identification of the benthic infauna across the six stations of the two intertidal transects surveyed at Ringaskiddy yielded a total count of 72 taxa, comprising 1,664 individuals ascribed to 6 phyla. Of the 72 taxa identified, 37 were identified to species level. The remaining 35 could not be identified to species level because they were juveniles, damaged, or indeterminate. The full faunal abundance species list can be seen in Appendix 1.

Of the 72 taxa recorded, 1 was a cnidarian (hydroid), 2 were nemerteans (ribbon worm), 1 was a nematode (round worm), 27 were annelids (segmented worms), 23 were arthropods (crabs, shrimps, insects *etc*.), and 18 were molluscs (mussels, cockles, snails etc).

Six taxa accounted for over 69% of the faunal abundance and all were present in each station: the oligochaete *Tubificoides benedii* (616 individuals, 37.02% abundance), Nematoda (163 individuals, 9.8% abundance), the polychaetes *Melinna palmata* (118 individuals, 7.09% abundance) and *Nephtys hombergii* (98 individuals, 5.89% abundance), the bivalve *Cerastodema edule* (104 individuals, 6.25% abundance), and the amphipod *Gammarus locusta* (58 individuals, 3.49% abundance).

3.2.1 Intertidal Univariate Analysis

Univariate statistical analyses were carried out on the combined replicates of the station-by-station faunal data. The following parameters were calculated and can be seen in Table 3.2; Total Number of Taxa, Total number of Individuals, Richness, Evenness, Shannon-Wiener diversity, Simpson's diversity and Effective Number of Species (ENS). Number of taxa ranged from 23 (T2 Upper and T2 Mid) to 33 (T1 Mid). Number of individuals ranged from 147 (T1 Lower) to 603 (T2 Upper). Richness ranged from 3.44 (T2 Upper) to 6.01 (T1 Lower). Evenness ranged from 0.47 (T2 Upper) to 0.87 (T2 Lower). Shannon-Wiener diversity ranged from 1.48 (T2 Upper) to 2.88 (T1 Lower). Simpson's diversity ranged from 0.54 (T2 Upper) to 0.93 (T1 Lower) Effective number of species ranged from 4.39 (T2 Upper) to 17.82 (T1 Lower), indicating that station T2 upper is over 4 times more diverse than T2 Upper. Figure 3.9 shows these community indices in graphical form.

Table 3-2: Univariate measures of intertidal community structure.

Station	No. Taxa	No. Individuals	Richness	Evenness	Shannon-Wiener Diversity	Effective Number of Species	Simpson's Diversity
	S	N	d	J'	H'(loge)	EXP(H')	1-Lambda
T1 Upp	24	288	4.06	0.66	2.11	8.24	0.82
T1 Mid	33	247	5.81	0.65	2.27	9.68	0.81
T1 Lwr	31	147	6.01	0.84	2.88	17.82	0.93
T2 Upp	23	603	3.44	0.47	1.48	4.39	0.54
T2 Mid	23	196	4.17	0.82	2.58	13.18	0.91
T2 Lwr	24	183	4.42	0.87	2.75	15.65	0.92

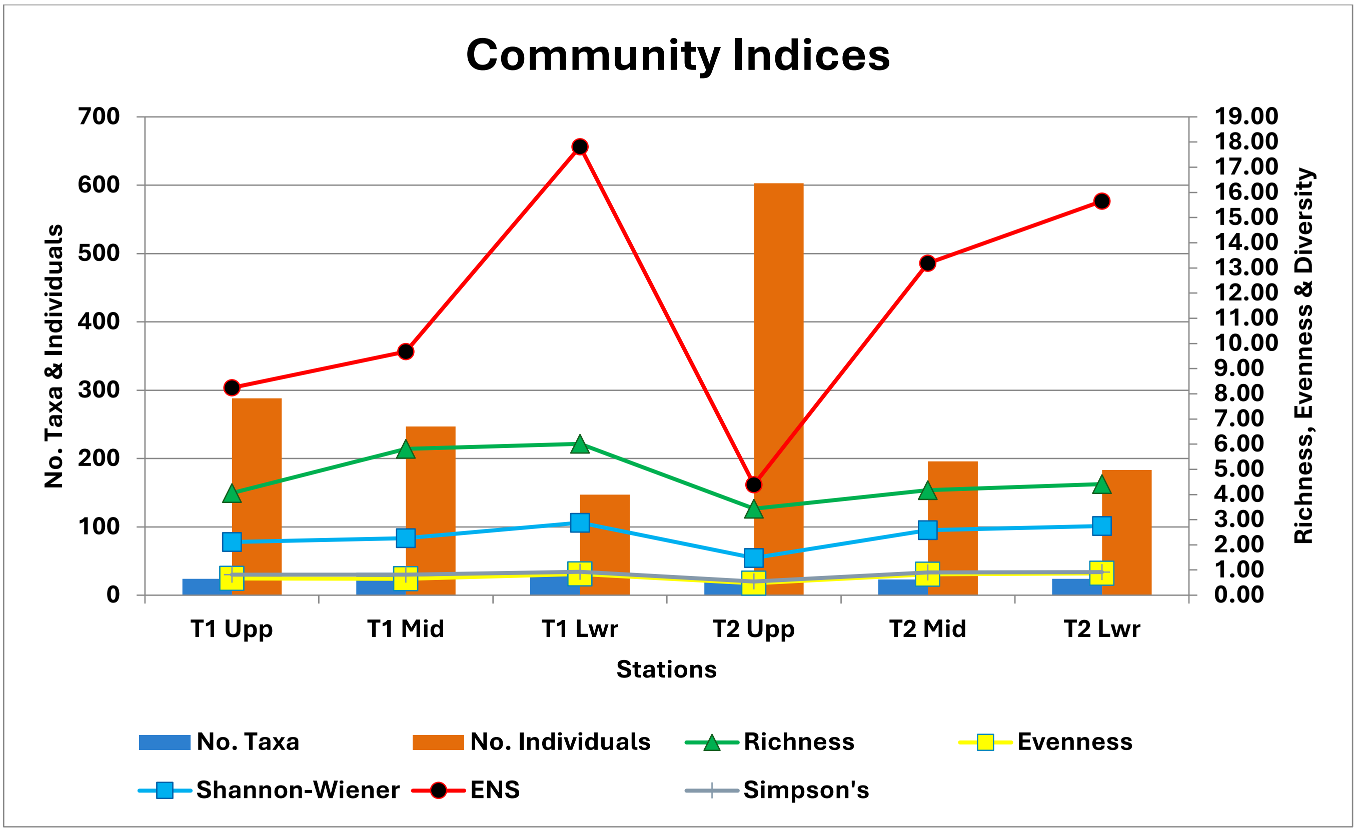

Figure 3-9: Intertidal community diversity indices. Diversity is expressed in Effective Number of Species (ENS), Shannon-Wiener Diversity index, and Simpson's Diversity index.

3.2.2 Intertidal Multivariate Analysis

The same data set used above for the intertidal univariate analyses was also used for the multivariate analyses. The dendrogram and the MDS plot can be seen in Figures 3.10 and 3.11, respectively. SIMPROF analysis revealed 2 statistically significant groupings between the 6 stations (the samples connected by red lines cannot be significantly differentiated). The stress level on the MDS plot indicates an excellent representation of the data with no prospect of misinterpretation of the structure.

A clear divide (57.87% dissimilarity) can be seen between **Group a** and **Group b**.

Group a consisted of stations T1 Lower, T2 Upper, T2 Mid, and T2 Lower. This group separated from Group b at a 57.87% dissimilarity level. Group a had a 54.02% within group similarity. This group contained 49 taxa comprising 1,129 individuals. Of the 49 taxa, 22 of the taxa were present twice or less. Six taxa accounted for over 70% of the faunal abundance: the oligochaete *Tubificoides benedii* (433 individuals, 38.35% abundance), the polychaetes *Melinna palmata* (113 individuals, 10.01% abundance) and *Nephtys hombergii* (83 individuals, 7.35% abundance), the bivalve *Cerastodema edule* (69 individuals, 6.11% abundance), Nematoda (49 individuals, 4.34% abundance), and the amphipod *Microprotopus maculatus* (58 individuals, 3.49% abundance). SIMPER analysis further revealed *Gammarus* sp. and Cirratulidae (damaged) as additional characterising for this group. *Tubificoides benedii* is a first order opportunist that proliferates in reduced sediments. Cirratulidae are second order opportunistic species present in slight to pronounced unbalanced conditions. *Melinna palmata, Cerastoderma edule,* and Nematoda are tolerant of disturbance, occurring under normal conditions, but their populations are stimulated by organic enrichment. *Nephtys hombergii* indifferent to enrichment and are typically present in low densities with non-significant variations over time. *Microprotopus maculatus* and *Gammarus* sp. are very sensitive to organic enrichment and are present in unpolluted conditions.

Group a stations exhibit elements of the JNCC biotopes 'SS.SMu.SMuVS.AphTubi *Aphelochaeta marioni* and *Tubificoides* spp. in variable salinity infralittoral mud' (EUNIS code A5.322) (De-Bastos & Hiscock, 2016) and 'LS.LMx.Mx.CirCer Cirratulids and *Cerastoderma edule* in littoral mixed sediment' (EUNIS A2.421) (Tillin & Marshall, 2016).

Group b consisted of stations T1 Upper and T1 Mid. This group separated from Group a at a 57.87% dissimilarity level. Group b had a 48.05% within group similarity. This group contained 44 taxa comprising 535 individuals. Of the 44 taxa, 24 of the taxa were present twice or less. Six taxa accounted for over 76% of the faunal abundance: the oligochaetes *Tubificoides benedii* (183 individuals, 334.21% abundance) and *Tubificoides brownae* (25 individuals, 4.67% abundance), Nematoda (114 individuals, 21.31% abundance), the bivalve *Cerastoderma edule* (35 individuals, 6.54% abundance), the amphipod *Gammarus locusta* (34 individuals, 63.6% abundance), and the gastropod *Peringia ulvae* (18 individuals, 3.36% abundance) SIMPER analysis could not be carried out as the group only contained 2 stations. *Tubificoides benedii* is a first order opportunist that proliferates in reduced sediments. *Cerastoderma edule,* Nematoda, and *Peringia ulvae* are tolerant of disturbance, occurring under normal conditions, but their populations are stimulated by organic enrichment. *Gammarus locusta* are very sensitive to organic enrichment and are present in unpolluted conditions.

Group b stations also exhibit elements of the JNCC biotopes ‘LS.LMx.Mx.CirCer Cirratulids and *Cerastoderma edule* in littoral mixed sediment (EUNIS A2.421) (Tillin & Marshall, 2016).

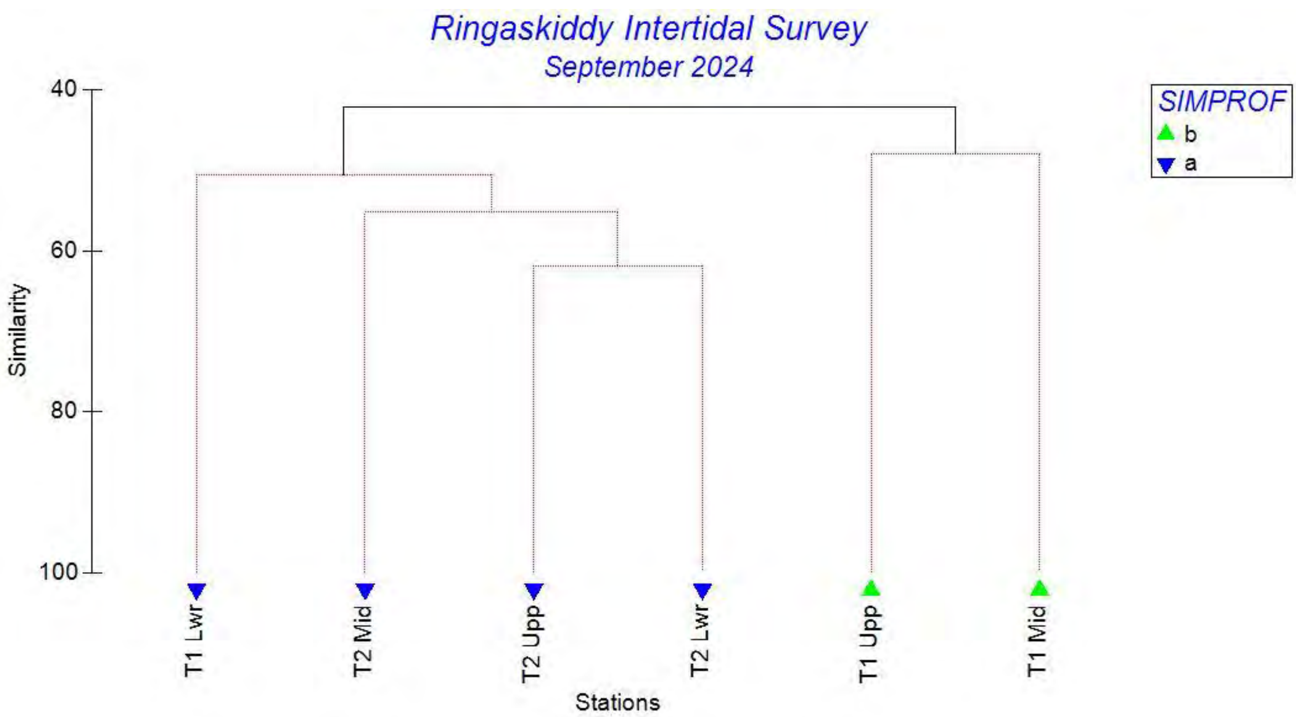

Figure 3-10: Dendrogram produced from Cluster analysis of the intertidal data

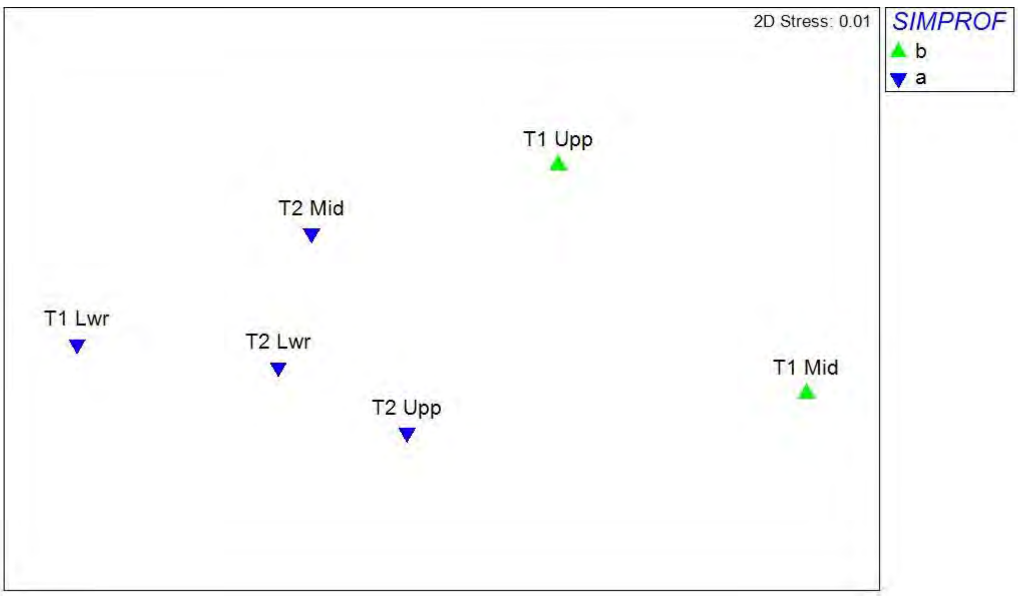

Figure 3-11: MDS plot of the intertidal data.

3.3 Sediment Results

3.3.1 Subtidal Sediments

Table 3.3 shows the sediment characteristics of the subtidal stations surveyed including the granulometry and the percentage organic carbon.

The sediment sampled within the study area was classified as muddy sand, gravelly sand, gravelly muddy sand, and slightly gravelly muddy sand according to Folk (1954). Highest levels of medium gravel-boulders, fine gravel and very fine gravel were recorded at St. 4 (9.8%, 11.7%, and 14.6% respectively). Highest levels of very coarse sand and coarse sand were found at St. 14 (20.2% and 18.1% respectively). Highest levels of medium sand were recorded at St. 6 (13.6%). Highest levels of fine sand were found at St. 1 (13.9%). Highest levels of very fine sand were found at St. 7 (28.9%) and highest levels of silt-clay were found at St. 13 (56.5%). Figure 3.12 shows the breakdown of sediment composition at each station and Figure 3.13 illustrates the sediment type according to Folk (1954).

Organic matter values ranged from 5.81% (St.14) to 10.15% (St. 2) in the subtidal stations.

3.3.2 Intertidal Sediments

Table 3.4 shows the sediment characteristics of the intertidal stations surveyed including the granulometry and the percentage organic carbon.

The sediment sampled within the study area was classified as muddy sand, gravelly muddy sand, and slightly gravelly muddy sand according to Folk (1954). No stations had medium gravel-boulders. Highest levels of fine gravel and very fine gravel were recorded at T1 Mid (2.7% and 8.2% respectively). Highest levels of very coarse sand were recorded at T1 Upper (14.7%). Highest levels of coarse sand were found at T1 Lower (9.1%). Highest levels of medium sand were recorded at T2 Lower (10.5%). Highest levels of fine sand were found at T2 Mid (53.9%). Highest levels of very fine sand were found at T1 Mid (38.9%) and highest levels of silt-clay were found at T1 Upper (34.9%). Figure 3.13 shows the breakdown of sediment composition at each station and Figure 3.14 illustrates the sediment type according to Folk (1954).

Organic matter values ranged from 3.6% (T2 Mid) to 6.22% (T1 Lower) in the intertidal stations.

Table 3-3: Sediment characteristics of the benthic faunal stations sampled. LOI refers to the % organic carbon loss on ignition.

Station	>8mm	Fine Gravel (4-8mm)	Very Fine Gravel (2-4mm)	Very Coarse Sand (1-2mm)	Coarse Sand (0.5-1mm)	Medium Sand (0.25-0.5mm)	Fine Sand (125-250mm)	Very Fine Sand (62.5-125mm)	Silt-Clay (<63mm)	Folk (1954)	
St1	0	0.6	3.8	12.9	12.5	11.1	13.9	13.5	31.7	Slightly Gravelly Muddy Sand	8.55
St2	0	0	2.5	15.9	13	10.9	11.9	16.5	29.3	Slightly Gravelly Muddy Sand	10.15
St3	0	0.5	0.2	14.9	14.2	11.1	18	13.7	27.4	Muddy Sand	9.54
St4	9.8	11.7	14.6	15.9	12.9	9	4.8	7.8	13.5	Gravelly Muddy Sand	9.87
St5	0	1.9	1.4	16.1	15	11.1	12.1	16	26.4	Slightly Gravelly Muddy Sand	8.55
St6	0	0	0.1	9.9	13.9	13.6	5.5	19.2	37.9	Muddy Sand	9.08
St7	0	0.3	0.5	11.8	8.7	6.5	11.4	28.9	31.9	Muddy Sand	6.19
St8	0	4.8	4.1	11.5	11.1	10.9	1.5	26.3	29.7	Gravelly Muddy Sand	8.31
St10	0	0.3	0.8	12.8	12.5	8.7	1.7	11.3	51.9	Gravelly Muddy Sand	6.74
St11	0	0.1	0.8	10.7	10	7.4	4.7	18.9	47.4	Gravelly Sand	7.57
St13	0	0	0.2	7.2	5.3	5.1	5.8	20	56.5	Muddy Sand	8.38
St14	0	0.4	0	20.2	18.1	13	6.4	7.8	34.1	Slightly Gravelly Muddy Sand	5.81

Table 3-4: Sediment characteristics of the Intertidal faunal stations sampled. LOI refers to the % organic carbon loss on ignition.

Station	>8mm	Fine Gravel (4-8mm)	Very Fine Gravel (2-4mm)	Very Coarse Sand (1-2mm)	Coarse Sand (0.5-1mm)	Medium Sand (0.25-0.5mm)	Fine Sand (125-250mm)	Very Fine Sand (62.5-125mm)	Silt-Clay (<63mm)	Folk (1954)	LOI
T1 Upp	0	2.5	2.2	14.7	7.9	8.6	10.8	18.5	34.9	Slightly Gravelly Muddy Sand	5.47
T1 Mid	0	2.7	8.2	10.4	5.5	7	2.6	38.9	24.6	Gravelly Muddy Sand	5.78
T1 Lwr	0	1.2	3.3	14	9.1	9	5.8	27	30.6	Slightly Gravelly Muddy Sand	6.22
T2 Upp	0	0	0.5	10	6.9	9.5	33.5	12.8	26.9	Muddy Sand	5.82
T2 Mid	0	0	0.4	2.1	1.1	7.3	53.9	22.6	12.5	Muddy Sand	3.6
T2 Lwr	0	0.2	0.3	6.4	2.1	10.5	45.9	17.3	17.4	Muddy Sand	5.09

Coordinate Reference System: EPSG:3857
Scale: 1:15,817

Figure 3-12: A breakdown of sediment type fraction at each of the subtidal and intertidal stations.

Figure 3-13: Sediment type at each of the subtidal and intertidal stations according to Folk (1954).

4. Discussion

Marine Ecology surveys were carried out at Ringaskiddy in order to characterise the communities present in the subtidal and intertidal environment. Subtidal grab surveys took place on 23rd of July 2024. Multivariate analysis of the faunal samples revealed a clear divide between the stations within the inner Ringaskiddy harbour area and those outside. The stations within the inner harbour area can be classified as a mosaic of the JNCC biotopes SS.SMu.IFIMu.CerAnit *Cerastoderma edule* with *Abra nitida* in infralittoral mud' and 'SS.SSa.IMuSa.SsubNhom *Spisula subtruncata* and *Nephtys hombergii* in shallow muddy sand. The stations surveyed outside of the inner harbour area were classified as 'SS.SMu.ISaMu.MelMagThy *Melinna palmata* with *Magelona* spp. and *Thyasira* spp. in infralittoral sandy mud'.

The intertidal surveys took place on the 24th of July and 12th of September 2024. The initial intertidal walkover survey documented the biotopes present on the rock armour in the upper shore of the transect locations. These included 'LR.FLR.Lic.YG – Yellow and grey lichens on supralittoral rock', 'LR.LLR.F.Fspi – *Fucus spiralis* on sheltered upper eulittoral rock', and LR.LLR.F.Asc.FS – *Ascophyllum nodosum* on full salinity mid eulittoral rock'. In addition, an area of mussel beds that was identified in the previous surveys in the vicinity of the ADM jetty was again recorded in the present survey. This biotope can be classified as LS.LBR.LMus.Myt.Mu - *Mytilus edulis* beds on littoral mud'. During the intertidal walkover survey, attempts were made to survey two transects at low water using cores. However, it was apparent that due to the depth of mud at these locations it would be a health and safety risk. An alternative method was selected to sampling the transects at high water from a RIB using a small van Veen grab instead of cores. Multivariate analysis of the faunal data revealed two biotopes present along the transects: the JNCC biotopes SS.SMu.SMuVS.AphTubi *Aphelochaeta marioni* and *Tubificoides* spp. in variable salinity infralittoral mud' and 'LS.LMx.Mx.CirCer Cirratulids and *Cerastoderma edule* in littoral mixed sediment.

Table 4.1 lists the subtidal and intertidal biotopes identified. Full descriptions of each of these biotope types can be found on the Marine Biological Association MarLIN website[1]. The sensitivities of these biotopes to various pressures (Physical, Chemical, Biological, and Hydrological) are well understood and each biotope is assessed on the Resistance, Resilience, and Sensitivity of a variety of activities that could impact on them. The proposed dredging activities have the most potential to impact on the biotopes identified. Dredging may result in light siltation (deposition of less than 5cm depth), heavy siltation (deposition of greater than 30cm depth) and/or removal of the substrate by extraction.

[1] UK Marine habitat classification (22.04) list - MarLIN - The Marine Life Information Network

Table 4-1: Ringaskiddy Subtidal and Intertidal Biotopes and sensitivities to physical pressures.

Biotope	Sensitivity to Pressures		
	Physical – Dredging Light siltation (<5cm)	**Physical – Dredging Heavy siltation (>30cm)**	**Physical Removal of substrate (extraction)**
Subtidal			
SS.SMu.IFIMu.CerAnit *Cerastoderma edule* with *Abra nitida* in infralittoral mud	Low	Medium	Medium
SS.SSa.IMuSa.SsubNhom *Spisula subtruncata* and *Nephtys hombergii* in shallow muddy sand	Low	Medium	Medium
SS.SMu.ISaMu.MelMagThy *Melinna palmata* with *Magelona* spp. and *Thyasira* spp. in infralittoral sandy mud	Not Sensitive	Low	Medium
Intertidal			
LR.FLR.Lic.YG – Yellow and grey lichens on supralittoral rock	N.A.	N.A.	N.A.
LR.LLR.F.Fspi – *Fucus spiralis* on sheltered upper eulittoral rock	Low	Medium	N.A.
LR.LLR.F.Asc.FS – *Ascophyllum nodosum* on full salinity mid eulittoral rock	Medium	High	N.A.
LS.LBR.LMus.Myt.Mu - *Mytilus edulis* beds on littoral mud	Medium	Medium	High
SS.SMu.SMuVS.AphTubi *Aphelochaeta marioni* and *Tubificoides* spp. in variable salinity infralittoral mud	Not Sensitive	Low	Medium
LS.LMx.Mx.CirCer - Cirratulids and *Cerastoderma edule* in littoral mixed sediment	Low	Medium	Medium

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Appendix I

Subtidal and Intertidal Species Lists

Ringaskiddy Subtidal Fauna	AphiaID	St1	St2	St3	St4	St5	St6	St7	St8	St9	St10	St11	St13	St14
Actiniaria	1360								1			1		
Edwardsiidae	100665	1												
Tubulanus polymorphus	122637	1							4		2			1
Nematoda	799			1								1		1
Polynoidae	939								2			1		
Pholoe baltica (sensu Petersen)	130599	1							2		1	5		
Pholoe inornata (sensu Petersen)	130601			1										1
Sthenelais	129595											1		
Phyllodocidae	931	1												
Eteone longa	130616	1		1					1					
Phyllodoce mucosa	334512	9			1				2		1		3	1
Paranaitis kosteriensis	130662								1					
Parexogone hebes	757970											1		
Nephtys	129370	28	27	30	22	2	12	19	3	21	3	5	44	13
Nephtys hombergii	130359	1		6	2	6	3	1		20			9	3
Lumbrineridae	967								1					
Lumbrineris cingulata (aggregate)	130240											6		
Orbiniidae	902								1					
Cirratulidae	919					1								
Capitella	129211		6											
Mediomastus fragilis	129892											2		
Notomastus	129220	3	1						19		10	5		
Galathowenia oculata	146950											10	4	1
Pectinariidae	980	1	1						1					1
Lagis koreni	152367	2							3				1	
Sabellaria spinulosa	130867								5		4	5		2
Ampharetidae (aggregate)	981	6	37	7	7	1			1		2	4	152	5
Melinna palmata	129808	10	1						110		17	35	25	94
Ampharete lindstroemi (aggregate)	129781			1						1			25	

Ringaskiddy Subtidal Fauna	AphiaID	St1	St2	St3	St4	St5	St6	St7	St8	St9	St10	St11	St13	St14
Serpulidae	988								1		5			
Spirobranchus	129582											2		
Spirobranchus lamarcki	560033								7		4	1		
Tubificoides benedii	137571	1												
Callipallene	134581											1		1
Callipallene brevirostris	134643													1
Longipedia	115403											2	1	
Ostracoda	1078								1				2	
Euphilomedes sinister	127866	1							5		2	10	1	7
Cylindroleberis mariae	238708													1
Perioculodes longimanus	102915		1								1		2	1
Apolochus neapolitanus	236495								2			1		
Leucothoe lilljeborgi	102462								1		1			
Stenothoe monoculoides	103169										1			
Harpinia antennaria	102960													1
Ampelisca	101445	6							13		7	4	11	7
Ampelisca brevicornis	101891										1		6	3
Ampelisca spinipes	101928													2
Ampelisca tenuicornis	101930								6		4		25	23
Gammarus	101537												1	
Megaluropus agilis	102783												1	1
Melitidae	101397	1										3		
Abludomelita obtusata	102788											1		
Microprotopus maculatus	102380	1							6			1	2	4
Photis longicaudata	102383								2					5
Aoridae	101368										5			
Pariambus typicus	101857		1										2	7
Phtisica marina	101864								1			2	2	1
Pseudoprotella phasma	101871								1					1

Ringaskiddy Subtidal Fauna	AphiaID	St1	St2	St3	St4	St5	St6	St7	St8	St9	St10	St11	St13	St14
Gnathiidae (juvenile)	118278											1		
Gnathia oxyuraea (male)	118995										1	1		
Tanaopsis graciloides	136458								2			1		
Apseudes talpa	136285											1		
Cumopsis goodsir	110465												1	1
Bodotria	110387										1		2	
Bodotria scorpioides	110445	8		1					2		4	12	2	11
Eudorella truncatula	110535	3											5	6
Monopseudocuma gilsoni	422916												1	1
Pseudocuma longicorne	110627													1
Diastylis bradyi	110472												1	1
Diastylis cornuta	110474			1									1	1
Carcinus maenas	107381							1			1			
Peringia ulvae	151628	14	43	10		1				11				
Odostomia unidentata	141025												5	15
Tragula fenestrata	238068												5	16
Turbonilla lactea	141072	2											1	1
Retusa truncatula	141138													1
Nucula (juvenile)	138262	1												2
Nucula nitidosa	140589	2											2	
Mytilidae (juvenile)	211	4	111	37	1	11	6			116	4	7	19	3
Kurtiella bidentata	345281	2							1		1		1	
Cardiidae (juvenile)	229			1								1		
Parvicardium pinnulatum	181343											1		
Cerastoderma edule	138998	9	5	2					1	3	1		1	
Mactridae (juvenile)	230						1							
Mactra stultorum	140299		1										1	
Spisula subtruncata	140302		2										2	
Tellinidae (juvenile)	235	3	4	1						3			1	

Ringaskiddy Subtidal Fauna	AphiaID	St1	St2	St3	St4	St5	St6	St7	St8	St9	St10	St11	St13	St14
Gari (juvenile)	138388													1
Abra	138474	2	1	1					1					
Abra alba	141433										2	1	2	
Abra nitida	141435		2	20	2	8		1	1	20			20	9
Veneridae (juvenile)	243	4	1						3		3	3	6	3
Mysia undata	140728								1					2
Mya (juvenile)	138211								1					1
Varicorbula gibba	378492								1				2	2
Conopeum seurati	111352													P
Amphiuridae (juvenile)	123206											1		
Amphipholis squamata	125064											1		
Paraleptopentacta elongata	1474372	2							1		1		1	

Ringaskiddy Intertidal Fauna (T1)	AphiaID	T1 Upper 1	T1 Upper 2	T1 Upper 3	T1 Mid 1	T1 Mid 2	T1 Mid 3	T1 Lower 1	T1 Lower 2	T1 Lower 3
Nemertea	152391						7			
Tubulanus polymorphus	122637									1
Nematoda	799	2		65			47		13	2
Pholoe	129439					1			1	
Pholoe inornata (sensu Petersen)	130601									
Eteone longa	130616	1							1	
Phyllodoce	129455								1	
Phyllodoce mucosa	334512									
Glycera (juvenile)	129296									1
Goniada maculata	130140									
Nereididae (juvenile)	22496			2		1			1	
Nephtys	129370							1	1	
Nephtys hombergii	130359	5	1	5	3	1			4	8
Leitoscoloplos mammosus	130514			1					2	4
Scoloplos armiger	130537									1
Spionidae	913					1				
Streblospio shrubsolii	131193									
Cirratulidae	919					1	2		4	
Capitellidae	921						1			
Ampharetidae	981					1			13	1
Melinna palmata	129808			4		1			11	12
Ampharete lindstroemi agg.	129781	1								1
Branchiomma	129524								1	
Manayunkia aestuarina	130926			2						
Paranais litoralis	137485	2		2						
Tubificoides	137393	1		1			2			
Tubificoides benedii	137571	31	8	54		3	87		1	

Ringaskiddy Intertidal Fauna (T1)	AphiaID	T1 Upper 1	T1 Upper 2	T1 Upper 3	T1 Mid 1	T1 Mid 2	T1 Mid 3	T1 Lower 1	T1 Lower 2	T1 Lower 3
Tubificoides brownae	137572	1		23		1				
Acari	292684					1				
Austrominius modestus	712167					7				
Semibalanus balanoides	106210								2	
Ostracoda	1078			1						
Amphipoda	1135	1								
Dexamine thea	102136									
Gammaridae	101383					2				
Gammarus	101537	1							6	
Gammarus locusta	102281	1			24	5	4		1	2
Melitidae	101397						2			
Melita palmata	102843				1					
Microprotopus maculatus	102380					1		2	10	5
Aoridae	101368			3		2			1	1
Microdeutopus	101471									
Microdeutopus gryllotalpa	102048				1					
Monocorophium sextonae	148603									
Caprellidae	101361					1				
Caprella	101430									
Lekanesphaera monodi	118956				1		1			
Jaera albifrons	118715				1		1			
Zeuxo holdichi	416601									
Carcinus maenas	107381	1				2	5			
Boreochiton ruber	386411				1	1	2			
Gastropoda	101	1								
Littorina littorea	140262						10			
Peringia ulvae	151628		11	6		1				
Bivalvia	105								1	3

Ringaskiddy Intertidal Fauna (T1)	AphiaID	T1 Upper 1	T1 Upper 2	T1 Upper 3	T1 Mid 1	T1 Mid 2	T1 Mid 3	T1 Lower 1	T1 Lower 2	T1 Lower 3
Mytilidae	211		2			1			8	
Parvicardium (juvenile)	137739								3	
Cerastoderma edule	138998	19		10		2	4	3	3	3
Mactridae	230			1						
Spisula subtruncata	140302					1				
Tellinidae (juvenile)	235								2	
Macomangulus tenuis	878470									
Abra	138474									2
Abra alba	141433									
Abra nitida	141435				1	1				
Veneridae (juvenile)	243								1	
Mya arenaria	140430	8	2	8						1
Hiatella arctica	140103								1	

Ringaskiddy Intertidal Fauna (T2)	AphiaID	T2 Upper 1	T2 Upper 2	T2 Upper 3	T2 Mid 1	T2 Mid 2	T2 Mid 3	T2 Lower 1	T2 Lower 2	T2 Lower 3
Nemertea	152391									
Tubulanus polymorphus	122637									
Nematoda	799			7		13	1			13
Pholoe	129439									
Pholoe inornata (sensu Petersen)	130601							1		
Eteone longa	130616	1	2	5						2
Phyllodoce	129455									
Phyllodoce mucosa	334512		2		1	1	1	2		1
Glycera (juvenile)	129296									
Goniada maculata	130140					1				

Ringaskiddy Intertidal Fauna (T2)	AphiaID	T2 Upper 1	T2 Upper 2	T2 Upper 3	T2 Mid 1	T2 Mid 2	T2 Mid 3	T2 Lower 1	T2 Lower 2	T2 Lower 3
Nereididae (juvenile)	22496									1
Nephtys	129370	20	1					2		13
Nephtys hombergii	130359		8	11	4	8	8	14	12	6
Leitoscoloplos mammosus	130514						1	5	2	1
Scoloplos armiger	130537									
Spionidae	913									
Streblospio shrubsolii	131193			3			1			
Cirratulidae	919	3	4	2		8	5	2		8
Capitellidae	921					2	1			
Ampharetidae	981							4		
Melinna palmata	129808	19	20	15		4	9	12	6	5
Ampharete lindstroemi agg.	129781									
Branchiomma	129524									
Manayunkia aestuarina	130926									
Paranais litoralis	137485									
Tubificoides	137393		1						2	
Tubificoides benedii	137571	139	125	138		3	20			7
Tubificoides brownae	137572			17						8
Acari	292684									
Austrominius modestus	712167									
Semibalanus balanoides	106210									
Ostracoda	1078									
Amphipoda	1135									
Dexamine thea	102136		1							
Gammaridae	101383									
Gammarus	101537			8		5		5		
Gammarus locusta	102281	5		1	5	9				1
Melitidae	101397									

Ringaskiddy Intertidal Fauna (T2)	AphiaID	T2 Upper 1	T2 Upper 2	T2 Upper 3	T2 Mid 1	T2 Mid 2	T2 Mid 3	T2 Lower 1	T2 Lower 2	T2 Lower 3
Melita palmata	102843									
Microprotopus maculatus	102380	1		3	5	11		6		2
Aoridae	101368				2					
Microdeutopus	101471				1		1			
Microdeutopus gryllotalpa	102048									
Monocorophium sextonae	148603							1		
Caprellidae	101361	1								
Caprella	101430		3	3				4		
Lekanesphaera monodi	118956									
Jaera albifrons	118715									
Zeuxo holdichi	416601				1					
Carcinus maenas	107381	7	5	5			1			
Boreochiton ruber	386411									
Gastropoda	101									
Littorina littorea	140262									
Peringia ulvae	151628	2					1			1
Bivalvia	105									
Mytilidae	211			1						
Parvicardium (juvenile)	137739									
Cerastoderma edule	138998	3	4	3	6	3	23	13	4	1
Mactridae	230									
Spisula subtruncata	140302									
Tellinidae (juvenile)	235						1			
Macomangulus tenuis	878470						1			
Abra	138474	1	1					2		
Abra alba	141433						3			
Abra nitida	141435							2	3	
Veneridae (juvenile)	243									

Ringaskiddy Intertidal Fauna (T2)	AphiaID	T2 Upper 1	T2 Upper 2	T2 Upper 3	T2 Mid 1	T2 Mid 2	T2 Mid 3	T2 Lower 1	T2 Lower 2	T2 Lower 3
Mya arenaria	140430		1	1	5	9	11	6	2	1

Port of Cork (AYESA)

Ringaskiddy Drop Down Video Survey

AQUAFACT APEM Group

AQUAFACT Ref: P15494

November 2024

COMMERCIAL IN CONFIDENCE

Client: AYESA (Port of Cork)

Reference no: **P15494**

Date of issue: **19/11/2024**

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Report Approval Sheet

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2	Final	19/11/2024	Benthic Drop-down Video Survey, Ringaskiddy Final	M. McHugh Jewell	E. McCormack

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1. Introduction

AQUAFACT - APEM Group (hereafter referred to as AQUAFACT) was commissioned by Ayesa on behalf of the Port of Cork Company to conduct a drop-down video survey (DDV) as part of the preparation of an EIAR chapter on Marine Ecology for proposed developments.

On the 24th of July 2024, 28 drop-down video (DDV) recordings were carried out in the vicinity of the proposed development at Ringaskiddy. A high-resolution drop-down video system was deployed at 28 locations to characterise the flora and fauna in the area. AQUAFACT adheres to NMBAQC and JNCC guidelines for the best practice acquisition of video stills imaging of benthic substrata and epibenthic species. This ensures that the collected data meets the specific needs and requirements of the proposed survey, including broadscale habitat type analysis, identification of fauna, burrows, percentage cover of reef types, anthropogenic influences, and biotope classification.

This report provides an overview of the DDV observations made at each location, detailing the substrates and species encountered.

Ringaskiddy Port is an active ferry and bulk cargo port, reclaimed in the past from the Ringaskiddy shoreline. It is entirely enclosed by constructed structures, including a 480m quay on the western side and 1,400m of rock armour forming the rest of the perimeter. Additionally, there are several mooring dolphins within the inner basin, as well as Roll-on/Roll-off ramps. The port's outer boundary is separated from Monkstown Creek tidal flats by the 600m long ADM Jetty and a 430m long rock armour breakwater (ADM Training Wall). Virtually the entire Training Wall and around 350m of the ADM Jetty are located in the intertidal zone. The mouth of the basin, extending from the end of the ADM Jetty to the rock armour embankment on the eastern side, is 320m wide. The majority of Ringaskiddy Basin consists of the subtidal open-water area of the port, which predominantly features a soft sediment bottom at depths of 7-13m.

The main basin experiences regular ship traffic, and every few years, the bottom sediments are dredged along the berths and approaches to maintain a safe navigable depth. The basin is a very sheltered area, which is reflected in the dominance of its subtidal soft sediment substrate and, in the case of the perimeter rock armour, by its associated brown seaweed-dominated communities in the intertidal and adjoining shallow subtidal zones.

The Survey Plan for Assessing the Benthic Ecology of Ringaskiddy in 2024

The proposed development site ("the Site") is located at the Port of Cork, Ringaskiddy, Co. Cork. The Site is centred at approximate Irish Transverse Mercator (ITM) coordinates 706992, 735455 and is *ca*. 0.4ha.

This Drop-Down Video (DDV) study focuses on the maritime area near the proposed redevelopment of Ringaskiddy. The Port of Cork Company (POCC) has completed major redevelopment at Ringaskiddy under the permitted Strategic Infrastructure Development (PA0035, with modifications). The main elements of these works are operational, but further permission is needed to complete remaining works due to reporting requirements.

The remaining redevelopment at Ringaskiddy involves several key construction elements across multiple sites and are summarised below (also see redline boundaries Figure 1-1).

Ringaskiddy East (Container and Multi-purpose Berth (CB/MPB)):

- A Container Berth of approximately 200m in length (CCT 2)
- Dredging of the seabed to a level of -13.0 m Chart Datum (CD)
- Installation of link-span comprising a floating pontoon and access bridge
- Installation of container handling cranes
- Lighting and fencing

Ringaskiddy West (Deepwater Berth Extension):

- A new 182m extension to the existing Deepwater Berth (DWB) which will comprise a filled quay structure (of approximately 231m) extending no further seaward than the edge of the existing DWB
- Dredging works to varying levels to facilitate navigational access to the new facilities
- Lighting

Road Improvements:

- Improvements to internal road network at Ringaskiddy East to facilitate future access to the N28
- Lighting and fencing

The redevelopment also features Load on Load off (LoLo), Roll on and Roll off (RoRo), and general cargo operations, with specific quay structures, surfacing, and reclamation works. Key services such as drainage, lighting, and security systems will be installed to ensure the safe and efficient operation of the terminal.

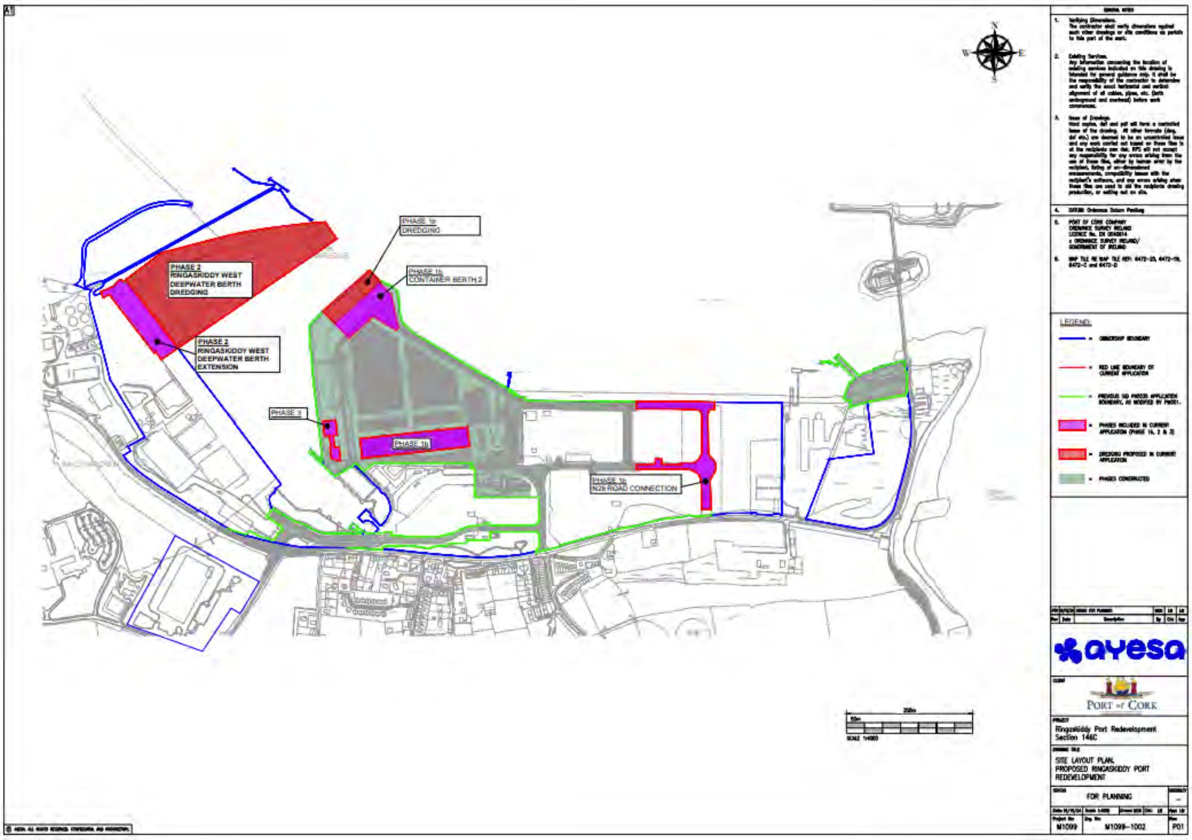

Figure 1-1: Ringaskiddy development site

2. Materials & Methods

2.1 Ringaskiddy Drop Down Video (DDV)

AQUAFACT staff conducted this beam DDV survey on the 27th of June in the vicinity of Ringaskiddy. The beam trawl was deployed from the Denis Murphy, a vessel kindly provided by the Port of Cork.

The drop-down camera used was the STR SeaSpyder Nano, an ultra-compact system offering high-resolution digital imaging and photographic-quality illumination. The system featured the latest generation STR SeaCam Mini IP camera and two ultra-efficient STR SeaLight LED lights, installed on a lightweight deployment frame with a 50m Kevlar-reinforced umbilical. Real-time HD video was captured using the supplied STR VidOverlay software. Laser scaling was integrated into the camera system, which was essential for conducting an assessment and for accurately measuring percentage cover.

Short drifts were used at each station, with video recorded along each transects, with the camera positioned approximately 50cm to 1m above the seabed. The camera was landed on the seabed along each transect, enabling an assessment of spatial variability.

At each station, the immediate survey area was checked for obstructions, such as static gear. Notes were made in-situ on visible sediment conditions, seabed features, flora and fauna, and notable sensitive and protected species, along with the DGPS position, water depth, date, and time.

The camera was lowered to the seafloor and a recording made of the bottom type and flora and fauna encountered. Once the camera was recording, the boat was allowed to drift with the current during filming (for approximately two minutes) to get representative footage along each camera deployment. All captured video footage was reviewed, and substrate type and characterising species were noted and used to assess any changes in the environment.

The survey sites were in the sublittoral zone, in areas of low to medium energy, exposed to tidal action. There were 28 locations studied. Stations covered the entire expanse of Ringaskiddy, and depths ranged from 1 m to 16 m.

2.2 Ringaskiddy DDV Locations

The locations for the drop-down video surveys (Figure 2-1) were selected to provide a visual assessment of the various biotopes within the Ringaskiddy basin, as well as the areas outside where proposed developments are planned.

Figure 2-1: Drop Down Video locations Ringaskiddy

The GPS coordinates for the drop-down video stations are shown in Table 2-1.

Table 2-1: Locations of drop-down video stations in 2024.

Station	2024 – Subtidal Video positions	
1	51.83669	-8.32142
2	51.83658	-8.32357
3	51.83629	-8.32409
4	51.83537	-8.32471
5	51.83585	-8.32484
6	51.83491	-8.32458
7	51.83397	-8.32443
8	51.83268	-8.32422

Station	2024 – Subtidal Video positions	
9	51.83268	-8.32422
10	51.83139	-8.32375
11	51.8317	-8.3256
12	51.83267	-8.32556
13	51.83357	-8.32682
14	51.83527	-8.32886
15	51.83561	-8.33096
16	51.83646	-8.33212
17	51.83671	-8.3309
18	51.83776	-8.32986
19	51.83736	-8.32918
20	51.8378	-8.32759
21	51.8386	-8.32584
22	51.83928	-8.32796
23	51.83757	-8.32441
24	51.83706	-8.32206
25	51.83718	-8.32182
26	51.83744	-8.32158
27	51.83768	-8.32124

3. Results

Table 3-1 shows the initial field observations by the AQUAFACT survey team working onboard the vessel. This table includes the station numbers, success or failure of collecting DDV, approximate depth, sediment type or benthic habitats observed, and relevant comments are summarised in the table below. There was significant variation in depth across the sites studied, and at many locations, considerable sediment was observed in the water column. At station 11, it was initially thought that no video was collected, but a substantial amount of footage was available for assessment. Stations 10, 12, and 14 were not visited.

Table 3-1 DDV stations, video collected, file name, depth (m), sediment type and observations.

Station (ST)	Video collected	File name	Depth(m)	Sediment type	Observations
1	Y	ST01 240724	6	Mud	Featureless
2	Y	ST02 240724	11	Mud	Shell, some rock
3	Y	ST03 240724	10	Mud	Anoxic, Plow track
4	Y	ST04 240724	15	Mud	Shell, Crab, Green Algae, Tunicates, Mussels
5	Y	ST05 240724	14	Mud	Featureless, brief sighting of a cephalopod
8	Y	ST08 240724	13.5	Mud	Green and brown algae
9	Y	ST09 240724	11	Mud	Featureless
11	Photos only	ST11 240724	7	Mud	Crabs
13	Y	ST13 240724	13	Mud	
15	Y	ST15 240724	9	Mud	Gobies
16	Y	ST16 240724	9.6	Mud	Featureless
17	Y	ST17 240724	14	Mud	Gobies, drift algae
18	Y	ST18 240724	1	Mud	Algae
19	Y	ST19 240724	10.8	Sandy Mud	Shelly, crabs
20	Y	ST20 240724	10.3	Mud	Shelly, sandy, velvet crabs, gobies
21	Y	ST21 240724	10.3	Muddy sand	Drift weed, large brown weed, shell
22	Y	ST22 240724	10.2	Mud	Shells *M. edulis*, unsafe waters, quick

Station (ST)	Video collected	File name	Depth(m)	Sediment type	Observations
24	Y	ST24 240724	6	Mud	Rock Armour, shells, fan brown algae
25	Y	ST25 240724	10	Mud	Rocky, Fan brown algae
26	Y	ST26 240724	14.5	Mud	Shell, brown & green algae, *A. rubens*
27	Y	ST27 240724	14.5	Mud	Shelly
28	Y	ST28 240724	16	Mud	Heavy Current, boat keeping at 3knts

3.1 Drop Down Video Results

Images of the seabed were captured from the videos recorded at each of the stations that drop-down video was deployed. Below is an analysis of each station based on review of the footage along with representative still images of the epibiotic communities. The distance between the green lasers in each image is 20 cm. Full video footage from each of the recordings is available through request from AQUAFACT if required.

3.1.1 ST 01 Biotope Description:

The transect video at station ST01 was 1 minute and 31 seconds long. The depth at this station was recorded as approximately 6 metres below chart datum. The substrate consisted of very fine, soft mud with a pock marked/dimpled surface. During the video, the sediment was disturbed, revealing anoxic layers beneath the surface, indicating high organic content and limited oxygen penetration.

The seabed appeared flat and featureless, and no macrofauna or epifauna were observed in this area. The fine-grained composition of the sediment points to a depositional environment typical of shallow coastal or estuarine habitats, where tidal movements or currents continually influence sediment dynamics.

Biotope classification: This station corresponds to the SS.SSa.IMuSa - Infralittoral muddy sand biotope, characterised by fine muddy sand substrates in shallow sublittoral areas. The lack of visible fauna and the presence of fine sediments suggest a relatively low-energy environment with organic-rich conditions. Alternatively, if more fine-grained sediments and higher silt content are confirmed, it could also align with SS.SMu.ISaMu - Infralittoral sandy mud biotope, which supports similar environments with soft mud and minimal epifaunal activity.

This station represents a benthic habitat where visible fauna is scarce.

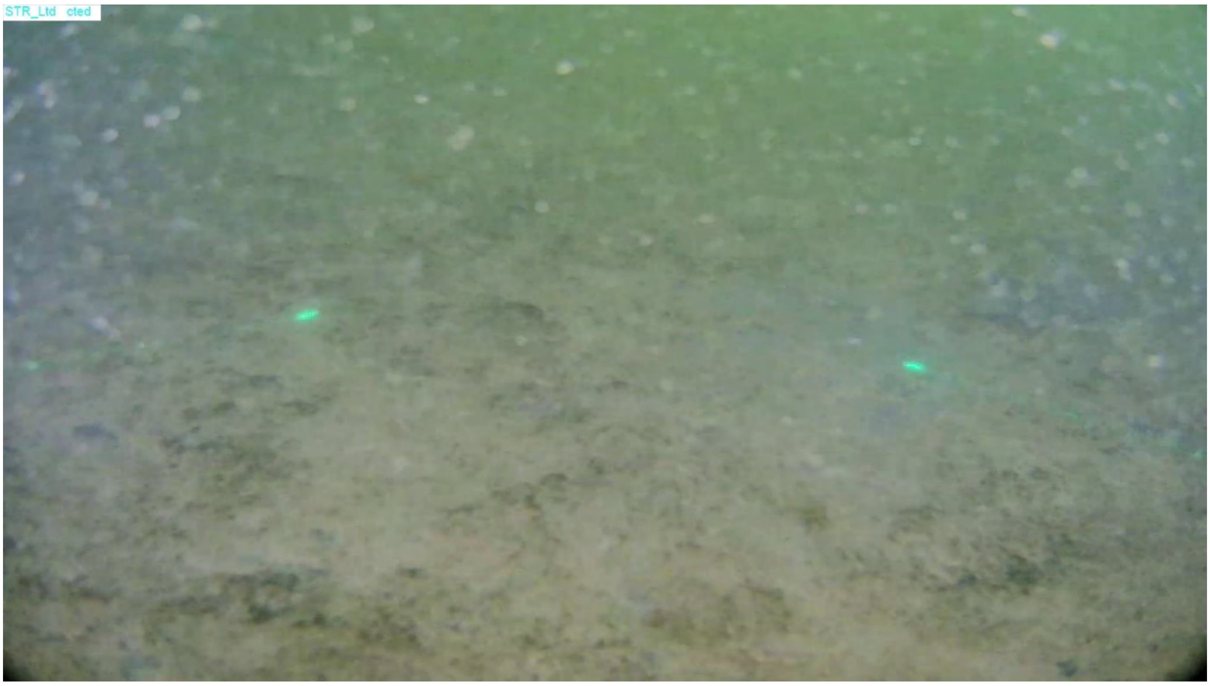

Figure 3-1: Representative video still from station ST 01.

3.1.2 ST 02 Biotope Description:

The transect video at station ST02 was 2 minutes and 18 seconds long. The depth at this station was approximately 11 metres below chart datum. The substrate consisted of a mixture of soft mud, shells, and some scattered rocks and stones, possibly of anthropogenic origin. These stones varied in colour, indicating different sources. The water had a noticeable green tinge, and considerable suspended particulate matter was present.

Green seaweed (*Ulva lactuca*) was observed, along with small tufts of brown algae, potentially *Laminaria* spp. A large rock was present and may serve as a habitat for marine life, though no epifaunal species were visibly attached.

Biotope classification: The biotope likely corresponds to SS.SMx.CMx - Circalittoral mixed sediment, characterised by a combination of soft mud, shells, and coarser materials like stones and debris. This biotope typically supports a variety of infaunal species, including polychaetes and bivalves, although none were visible in this transect. Alternatively, the station may also align with SS.SSa.IMuSa - Infralittoral muddy sand, particularly if the fine sediment dominates, with only occasional stones and debris.

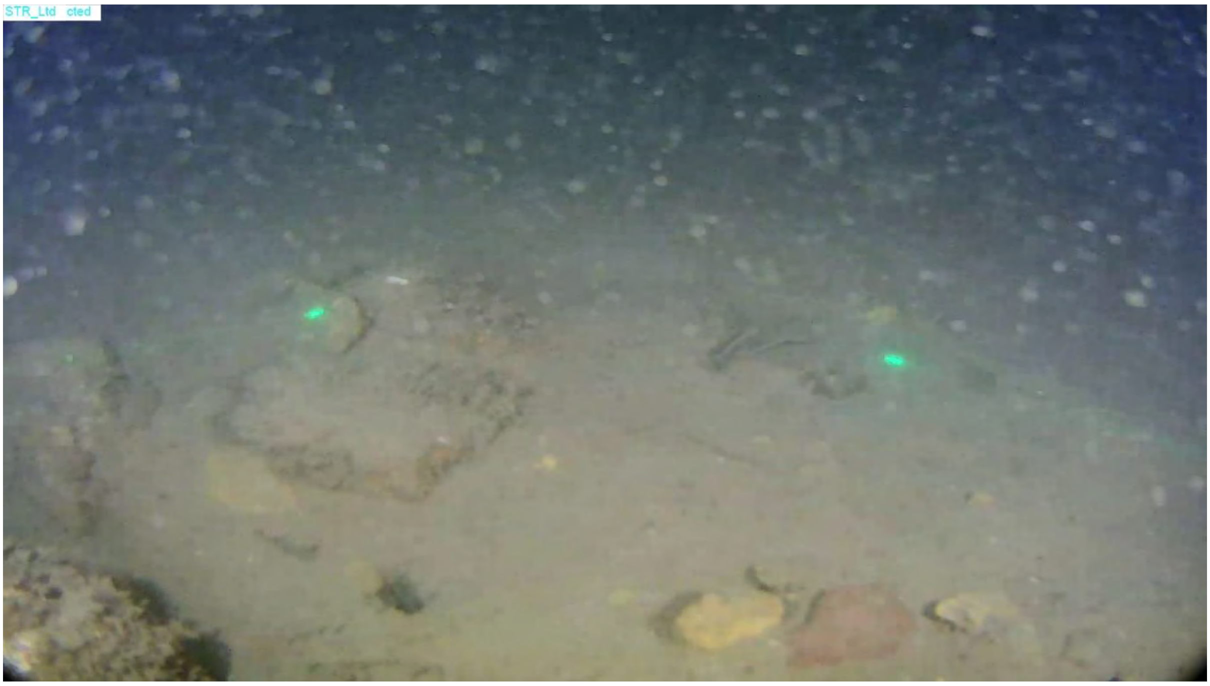

Figure 3-2: Representative video still from station ST 02.

3.1.3 ST 03 Biotope Description:

The transect video at station ST03 was 2 minutes and 54 seconds long. The depth at this station was approximately 10 metres. The substrate consisted of very fine mud, which showed minimal signs of biological activity. During the video the sediment was significantly disturbed, with clear resuspension of particles. Anoxic areas were visible within the sediment, suggesting limited oxygen penetration, possibly due to the cohesive nature of the fine mud.

A trench feature in the sediment was observed. No large fauna was observed.

Biotope classification: This station appears to be SS.SMu.IFiMu - Infralittoral fine mud biotope, which is characterised by fine muddy environments in low-energy areas, supporting a community of burrowing infauna like *Nephtys* spp. or *Thyasira* spp. The presence of anoxic layers and fine mud suggests poor water circulation, typical of this biotope. Alternatively, if the sediment has some sandy components, the SS.SMu.ISaMu - Infralittoral sandy mud biotope could also apply.

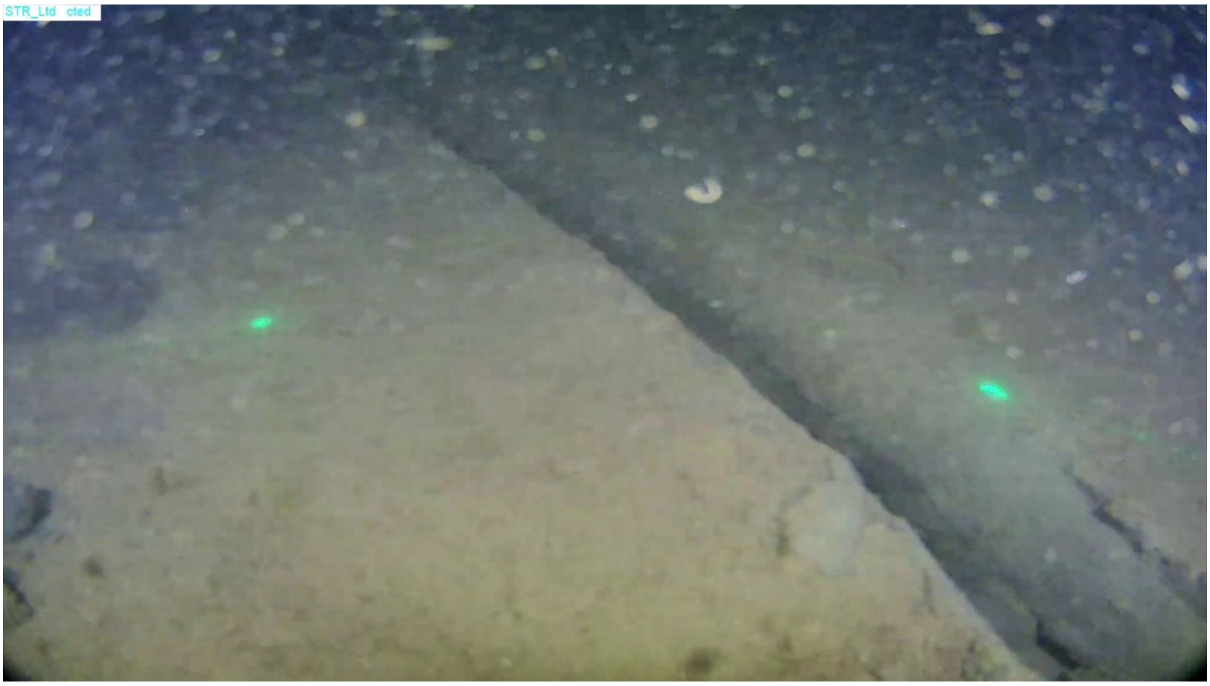

Figure 3-3: Representative video still from station ST 03.

3.1.4 St 04 Biotope Description:

The transect video at station ST04 was 2 minutes and 37 seconds long. The depth at this station was 15 metres. The substrate was primarily composed of mud, with the presence of shell material, green algae, and tunicates. A live mussel bed (*Mytilus edulis*) was observed, with mussels showing high growth rates and clean shells, many of which had barnacles (Balanidae) attached. A harbour crab (*Polybius depurator*) was visible, indicating a diverse and stable benthic community. The mussel shells were also home to sponges (Porifera) and other small organisms.

Biotope classification: This station is probably best classified under SS.SBR.SMus.MytSS - *Mytilus edulis* beds on sublittoral sediment, a biotope characterised by mussel beds in low-energy environments, where associated fauna such as crabs, sponges, and barnacles thrive. The combination of live mussels, sediment, and associated species matches the classification. Additionally, the presence of *Ulva* spp. (which may be may be detrital – particularly at this depth) is notable.

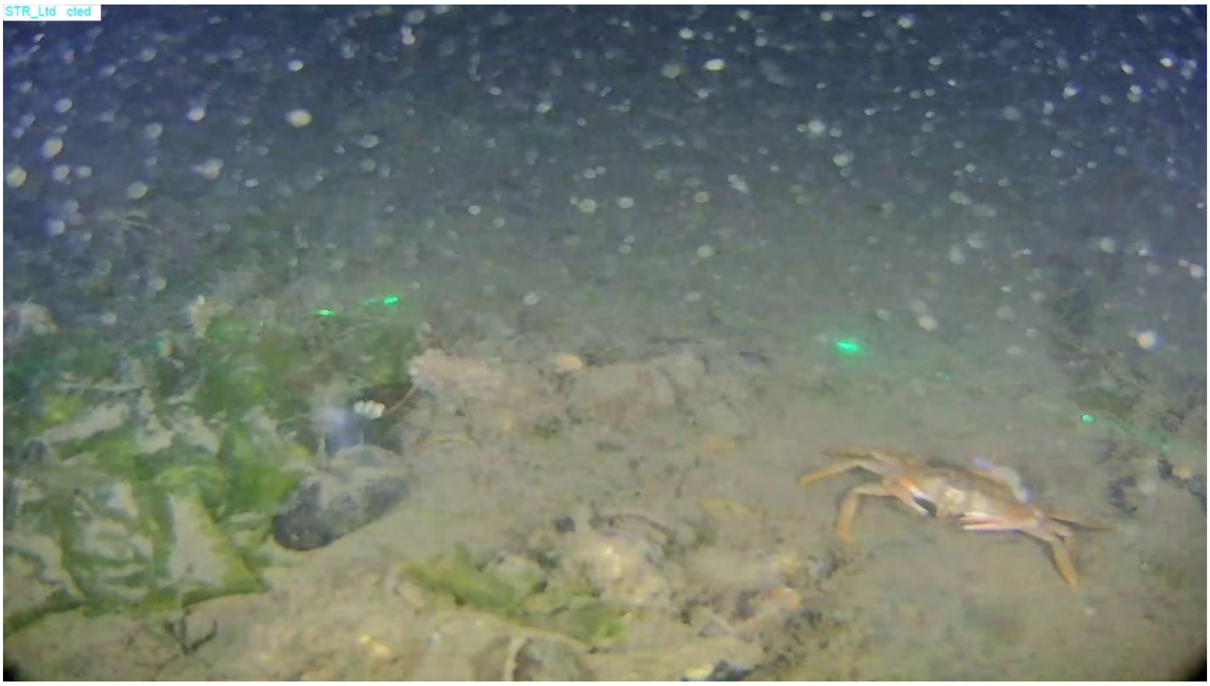

Figure 3-4. Representative video still from station ST 04.

3.1.5 ST 05 Biotope Description:

The transect video at station ST05 was 2 minutes long. The depth at this station is recorded as approximately 14 metres. The substrate consisted of fine mud, with anoxic layers exposed by the burrowing activity of some type of clam such as *Mya arenaria*. The seabed appeared uniformly smooth and featureless, with signs of anoxia suggesting organic enrichment, possibly influenced by its proximity to a harbour pier.

The water column contained a large amount of suspended particulate matter. There was a brief sighting of a cephalopod noted, though it did not remain visible for long. Additionally, a harbour crab (*Polybius depurator*) was observed burying itself into the sediment, indicating some faunal presence.

Biotope classification: SS.SMu.IFiMu - Infralittoral fine mud biotope, characterised by fine muddy sediment and low-energy environments where burrowing species such as clams thrive. The signs of anoxia and organic enrichment suggest a habitat typical of soft sediment depositional environments.

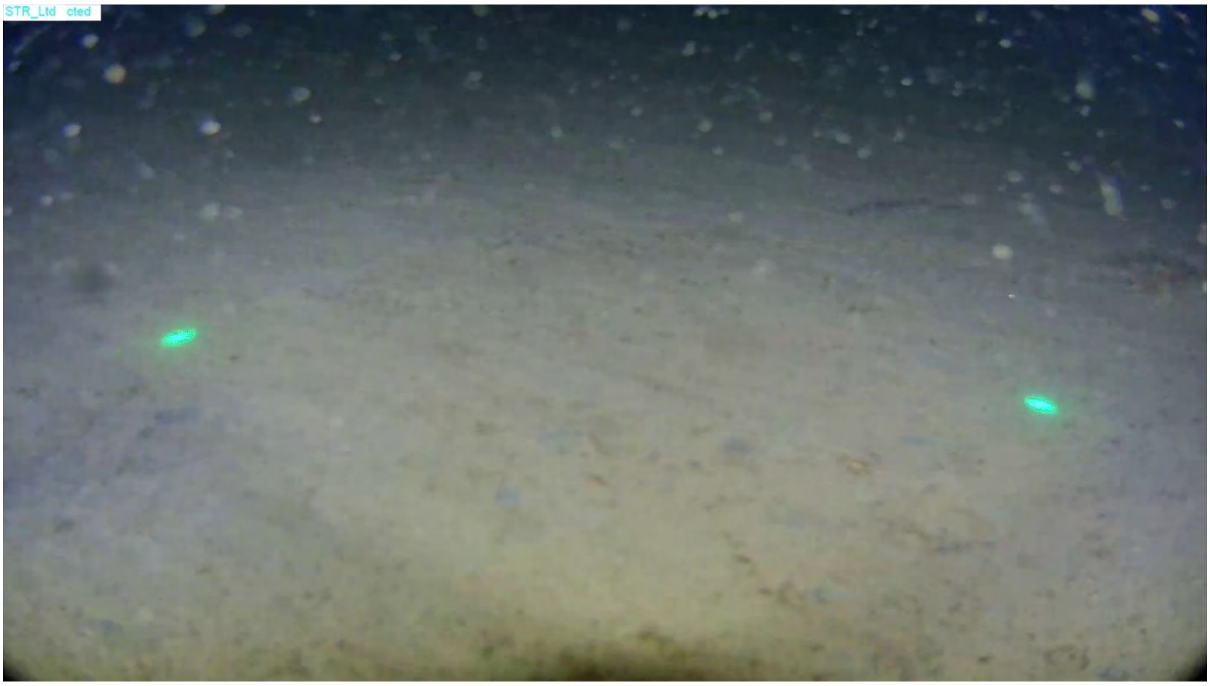

Figure 3-5: Representative video still from station ST 05.

3.1.6 ST 08 Biotope Description:

The video at station ST08 was 2 minutes and 16 seconds long. The depth at this station was recorded as approximately 13.5 metres. The water column had a green tinge, with moderate amounts of suspended particulate matter compared with the other sites observed. The substrate appears to be consisted of very fine mud, with some indications of mussel shell on the seabed. *Saccharina latissima* and other macroalgae, including green algae (*Ulva* spp.), were observed. A fish, likely a wrasse (Labridae), briefly swam through the frame.

The seabed appeared smooth and covered in fine sediment, characteristic of a low-energy environment, which allows fine particles to accumulate.

Biotope classification: This station likely corresponds to the SS.SSa.IMuSa - Infralittoral muddy sand biotope, which is characterised by fine sediment in sheltered, low-energy environments. The presence of macroalgae such as *Ulva* and *Saccharina latissima* suggests that the biotope may also have features similar to SS.SMp.KSwSS.SlatR - *Saccharina latissima* and red seaweeds on infralittoral sediments, but these may have been detrital in nature.

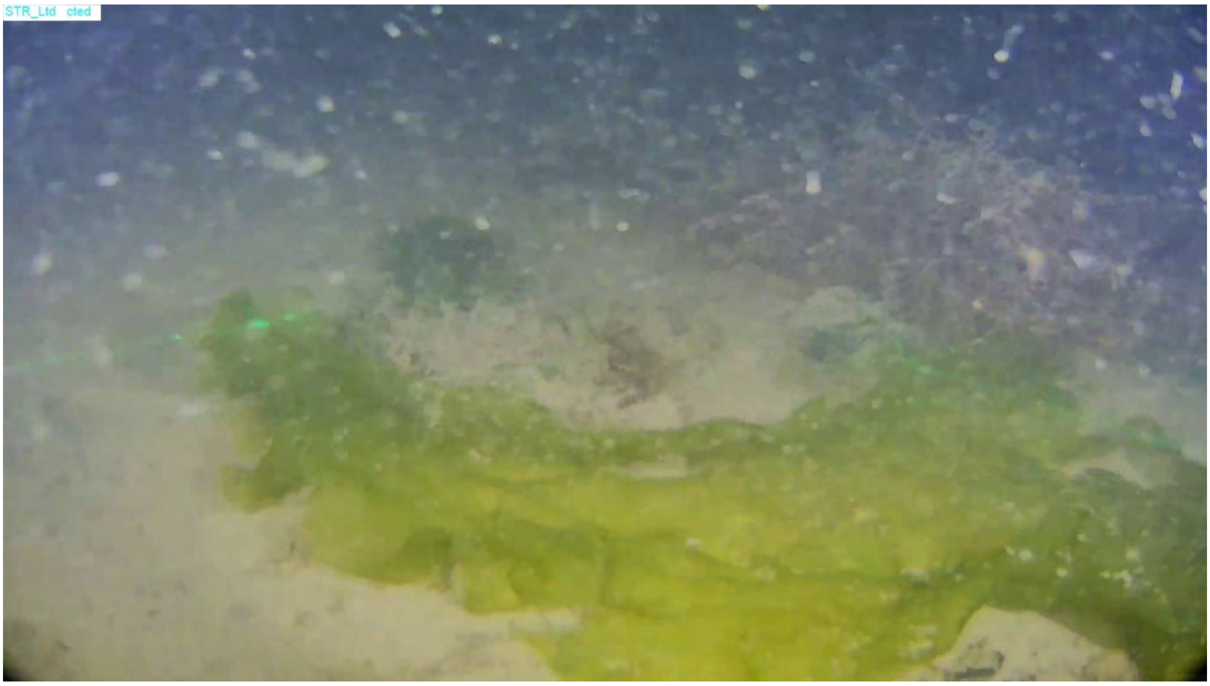

Figure 3-6: Representative video still from station ST 08.

3.1.7 ST 09 Biotope Description:

The transect video recording at station ST09 was 2 minutes and 3 seconds long. The depth at this station was recorded as approximately 11 metres. The substrate consisted of very fine mud, with an anoxic layer close to the surface, suggesting low oxygen levels and organic matter deposition. Fine suspended particulate matter was disturbed during the video drop, causing visible resuspension. The seabed appeared uniform and soft, with pitting and signs of burrowing.

Several green crabs (*Carcinus maenas*) were observed feeding and burrowing into the sediment, contributing to the pitted surface. Despite the active presence of crabs, the seabed remained relatively featureless, with no other visible macrofauna or flora in the frame.

Biotope classification: This station aligns with SS.SMu.IFiMu - Infralittoral fine mud biotope, which is typical of low-energy environments with fine sediment and anoxic conditions. The presence of crabs and organic enrichment reflects a habitat that supports burrowing fauna in soft, fine mud. The anoxic conditions and fine sediment point to low-energy depositional environments that allows for fine particles to settle and accumulate.

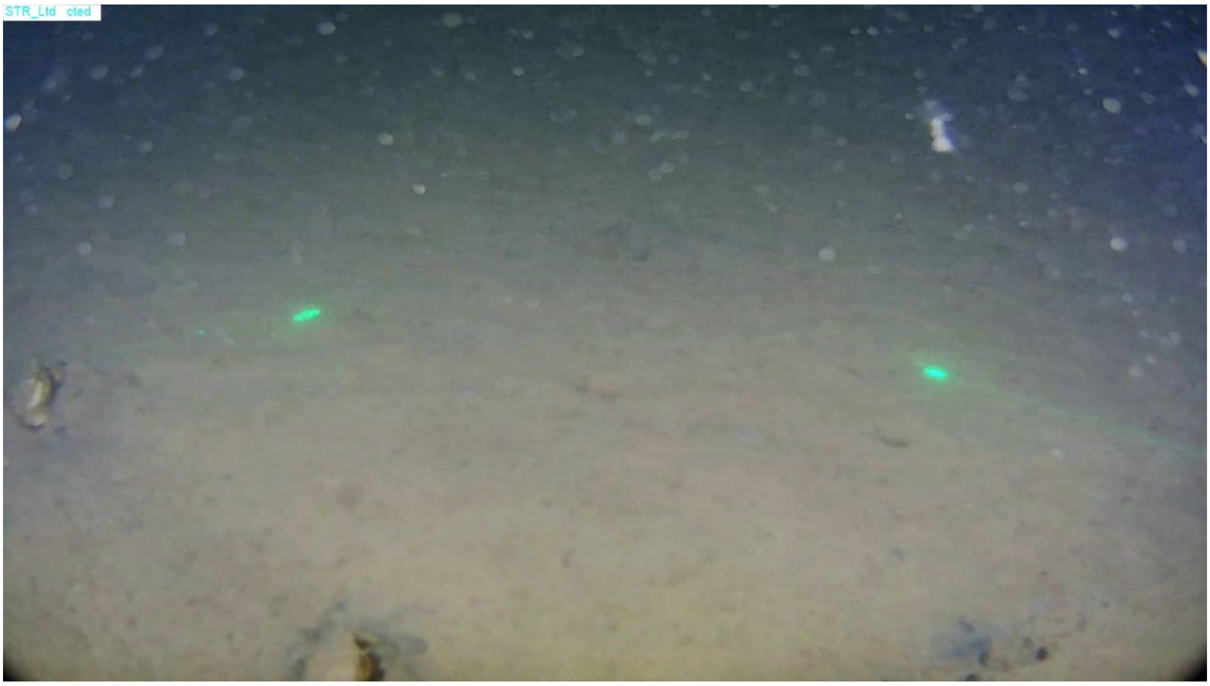

Figure 3-7: Representative video still from station ST 09.

3.1.8 ST 11 Biotope Description:

The transect video at station ST11 was 2 minutes and 9 seconds long. The depth at this station was recorded as 7 metres. The water column had an intense green tinge. The movement of the video equipment caused resuspension of particulate matter, indicating a fine-grained and cohesive substrate.

The currents appeared strong, and there was detritus on the seafloor, though its exact nature was unclear due to the speed of the video. A harbour crab (*Polybius depurator*) was observed moving across the soft sediment.

Biotope classification: This station corresponds to the SS.SSa.IMuSa - Infralittoral muddy sand biotope, characterised by fine, slightly muddy sediment in low-energy environments. The presence of a harbour crab indicates that this habitat supports burrowing and scavenging fauna, typical of infralittoral muddy sand environments.

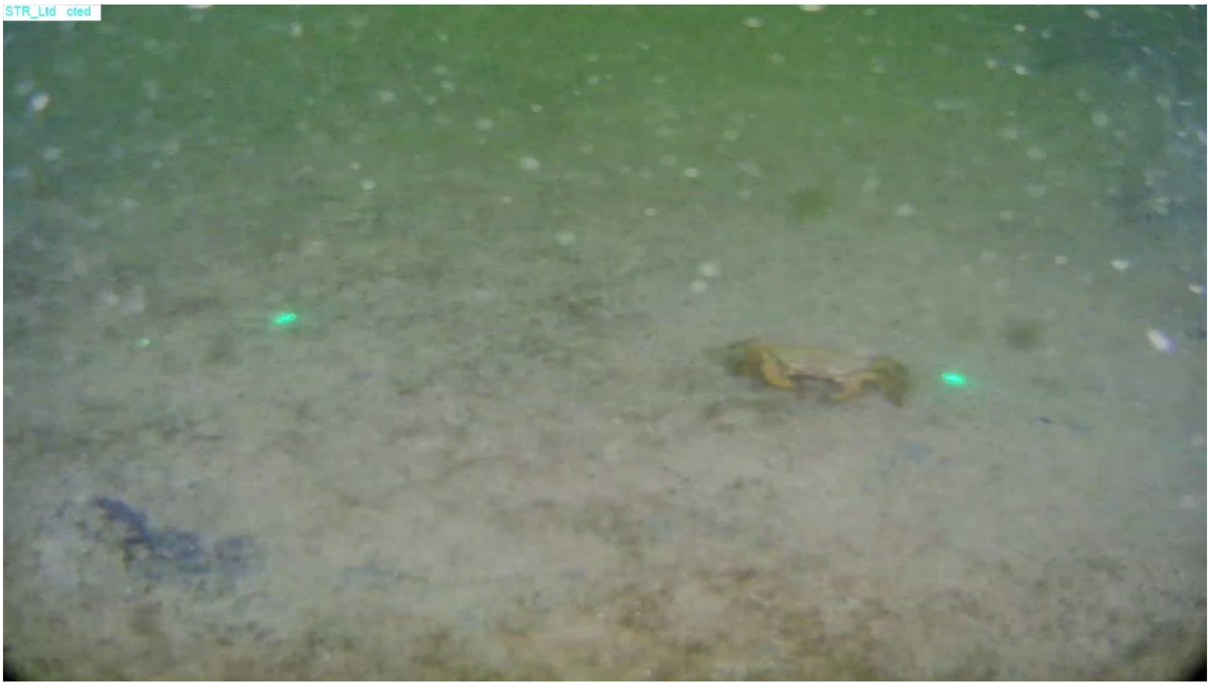

Figure 3-8: Representative video still from station ST 011.

3.1.9 ST 13 Biotope Description:

The video at station ST13 was 2 minutes and 39 seconds long. The depth was approximately 13 metres. The water column was very green, with a significant amount of suspended particulate matter. The seabed was relatively smooth and uniform, composed of fine mud with visible patches of exposed anoxic sediment, suggesting organic enrichment and low oxygen levels.

A harbour crab (*Polybius depurator*) was observed moving across the seabed. The fine, cohesive nature of the sediment suggests a depositional environment with limited disturbance.

Biotope classification: This station is classified under SS.SMu.IFiMu - Infralittoral fine mud, which typically supports burrowing infauna in low-energy environments with fine sediments and organic enrichment. The exposed anoxic patches and presence of particulate matter indicate that this habitat experiences limited water movement, allowing fine particles to settle and accumulate.

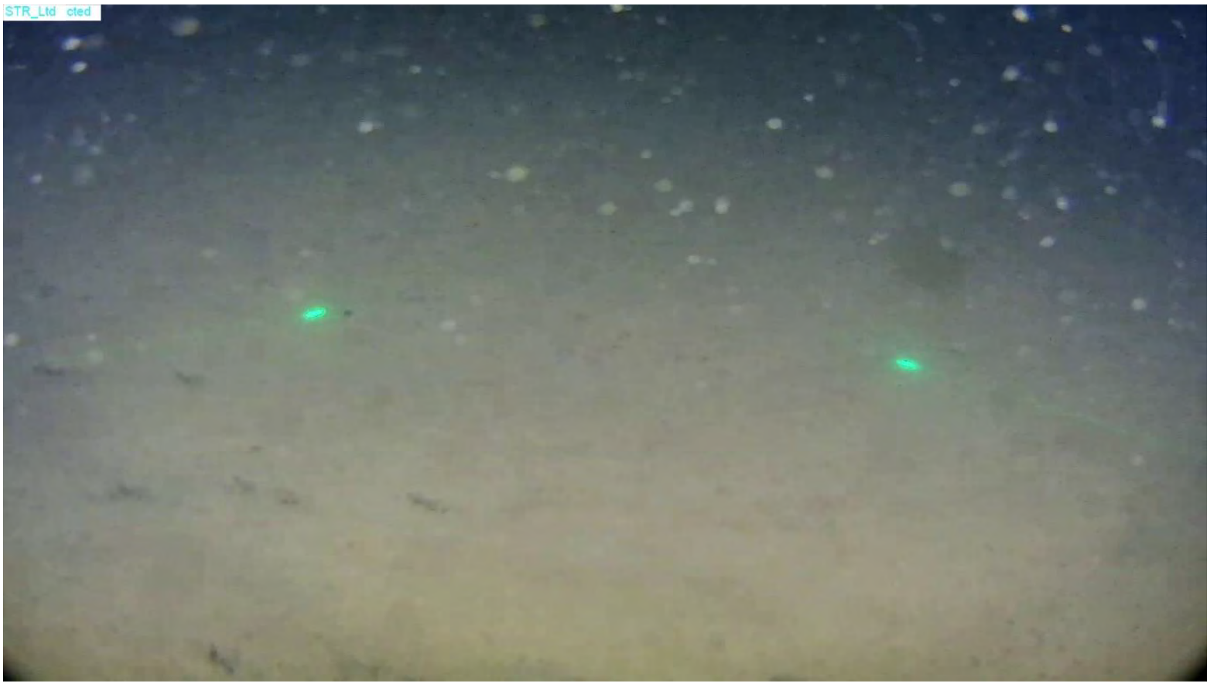

Figure 3-9: Representative video still from station ST 13.

3.1.10 ST 15 Biotope Description:

The transect video at station ST15 was approximately 3 minutes and 17 seconds long. The depth at this station was recorded as 9m. The substrate consisted of fine silty mud with benthic diatoms visible throughout. The station was located near rock armour. Several fish species were observed, including gobies (possibly *Gobius niger*) and probably common dragonets (*Callionymus lyra*). The water column had some suspended particulate matter, although it appeared less disturbed compared to other stations in the survey.

Biotope classification: This station likely corresponds to the biotope SS.SSa.IMuSa - Infralittoral muddy sand, which is characterised by fine muddy sand and associated benthic species adapted to such environments.

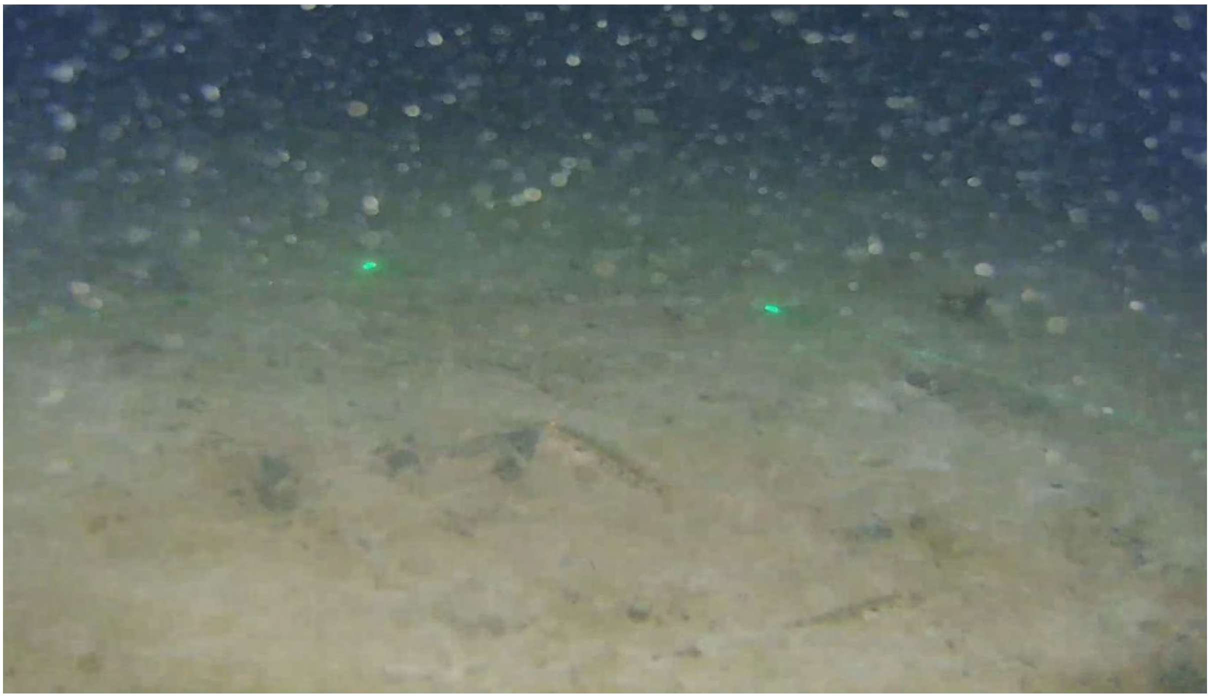

Figure 3-10: Representative video still from station ST 15.

3.1.11 ST 16 Biotope Description:

The transect video at station ST16 was 2 minutes and 6 seconds long. The depth at this station is recorded as approximately 9.6 metres. The substrate consisted of fine silt, with anoxic patches visible on the surface. The seabed was featureless and smooth, showing minimal topographical variation.

This station is most likely classified under SS.SMu.IFiMu - Infralittoral fine mud, which typically supports burrowing infauna in low-energy environments with fine sediments and organic enrichment. The exposed anoxic patches and presence of particulate matter indicate that this habitat experiences limited water movement, allowing fine particles to settle and accumulate.

Biotope classification: is likely to align with SS.SMu.CSaMu characterised by fine silt, low energy. Further sediment analysis and faunal assessment would confirm this.

Figure 3-11: Representative video still from station ST 16.

3.1.12 ST 17 Biotope Description:

The transect video at ST17 was 2 minutes and 42 seconds long. The depth at this station was recorded as approximately 14.2 metres. The seabed was smooth and uniform, composed of mud with visible anoxic patches. The site also featured patches of *Saccharina latissima* and green seaweed, possibly *Cladophora* spp.

The benthic fauna was diverse, with gobies and dragonets observed, contributing to the ecological complexity of the area. Drift algae were also present. The seabed's relative smoothness and low-energy characteristics are consistent with low-energy, fine-mud environments.

Biotope classification: for this site could be a combination of SS.SMp.KSwSS.SlatR—*Saccharina latissima* and red seaweeds on infralittoral sediments (if the *Saccharina* is attached) and SS.SMu.IFiMu—infralittoral fine mud, as the habitat reflects both the characteristics of kelp and green algae on sediment and the fine mud substrate with visible anoxic conditions. Further analysis of faunal composition and sediment characteristics would help refine this classification.

Figure 3-12: Representative video still from station ST 17.

3.1.13 ST 18 Biotope Description:

The transect video at station ST18 was 2 minutes and 30 seconds long. The depth at this station was 1 metre, representing a shallow coastal site. The seabed was characterised by a mixture of broken bivalve shells, interspersed with fine sediment. The substrate appeared more solid and compact than was observed at deeper stations, likely due to the coarser sediment.

Suspended particulate matter was significant in the water column during filming. Drifting green and red seaweeds were also observed, contributing to the nature of the site with detritus. Additionally, anoxic material was disturbed by the video drop, indicating that parts of the seabed may be poorly oxygenated beneath the surface.

Biotope Classification: The characteristics of this station are consistent with SS.SMx.IMx—infralittoral mixed sediment, as the substrate includes a mixture of coarse sediment and fine particles, with visible signs of productivity and organic matter accumulation.

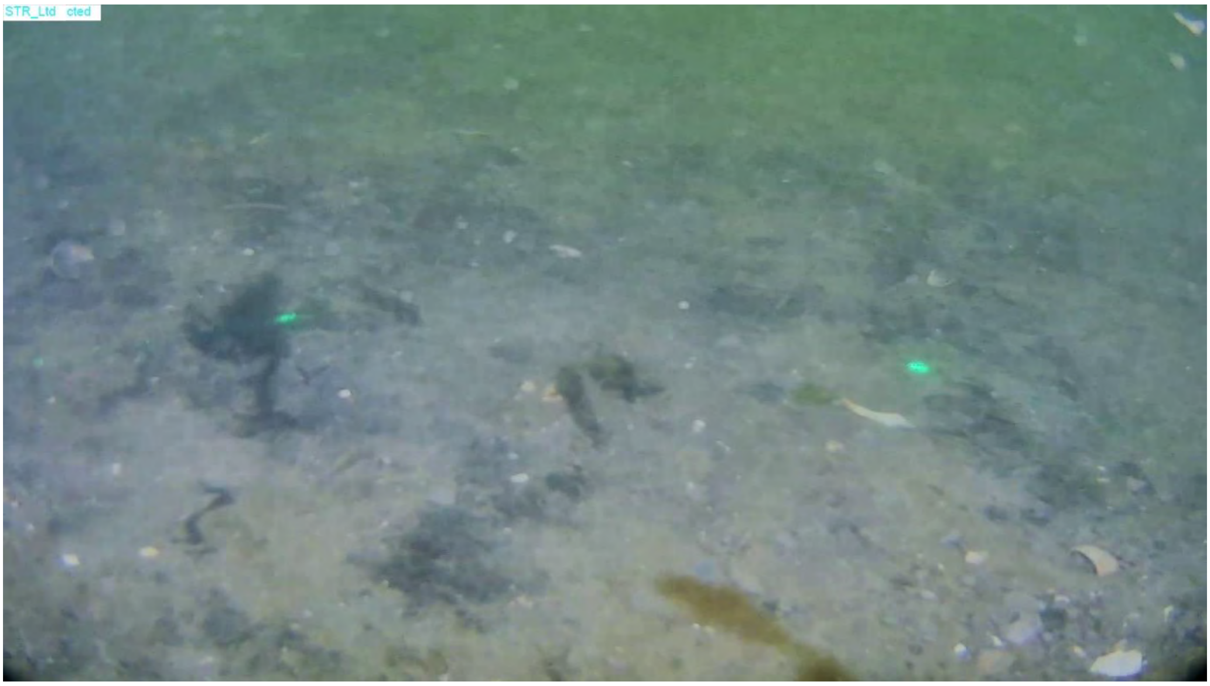

Figure 3-13: Representative video still from station ST 018.

3.1.14 ST 019 Biotope Description:

The transect video at station ST19 was 3 minutes and 10 seconds in length. The depth at this station was recorded as 10.4 metres. The seabed appeared firm in nature and covered with a variety of bivalve shells, including *Cerastoderma edule* (cockles) and clam species. Green crabs (*Carcinus maenas*) were observed, and there were filamentous green seaweeds (*Ulva intestinalis*).

The substrate appeared to be a mix of soft mud, fine silt, and coarser materials like small rocks and shell fragments, creating a complex habitat. Some suspended particulate matter was present, though less than at other stations. The presence of both live bivalves and shell debris suggests a stable, productive environment.

Biotope Classification: This station can be classified as SS.SMx.IMx—infralittoral mixed sediment.

Figure 3-14: Representative video still from station ST 019.

3.1.15 ST 020 Biotope Description:

The transect video at station ST20 was 3 minutes and 41 seconds in length. The depth at this station was recorded as 10.3 metres. The seabed was of a mixed nature, composed of sandy mud, with debris including bivalve shells, filamentous seaweeds, and live mussels (*Mytilus edulis*). *Laminaria saccharina* and *Ulva lactuca* were observed, along with green crabs (*Carcinus maenas*) and gobies. The substrate appeared firm, with anoxic layers exposed by the video drop, suggesting a dynamic habitat with active biological processes.

Biotope Classification: SS.SMx.IMx—infralittoral mixed sediment, characterised by a mixture of fine and coarse sediments, live mussels, and diverse fauna.

Figure 3-15: Representative video still from station ST 020.

3.1.16 ST 021 Biotope Description:

The transect video at station ST21 was 3 minutes and 49 seconds long. The depth at this station was 10.3 metres. The substrate was firm, consisting of mud with filamentous green algae, stones, and bivalve shell fragments. A strong horizontal current was observed, likely influencing sediment deposition and resuspension. Large brown seaweed fronds and significant amounts of broken shell material were present, likely due to the strong currents. The substrate's firmness and the shell fragments suggest a moderately disturbed environment with some habitat complexity.

Biotope Classification: The site likely falls under SS.SMx.IMx—infralittoral mixed sediment, given the mix of fine mud, coarse materials, and the presence of shell fragments and algae. The strong currents and habitat complexity suggest a dynamic environment supporting diverse benthic fauna.

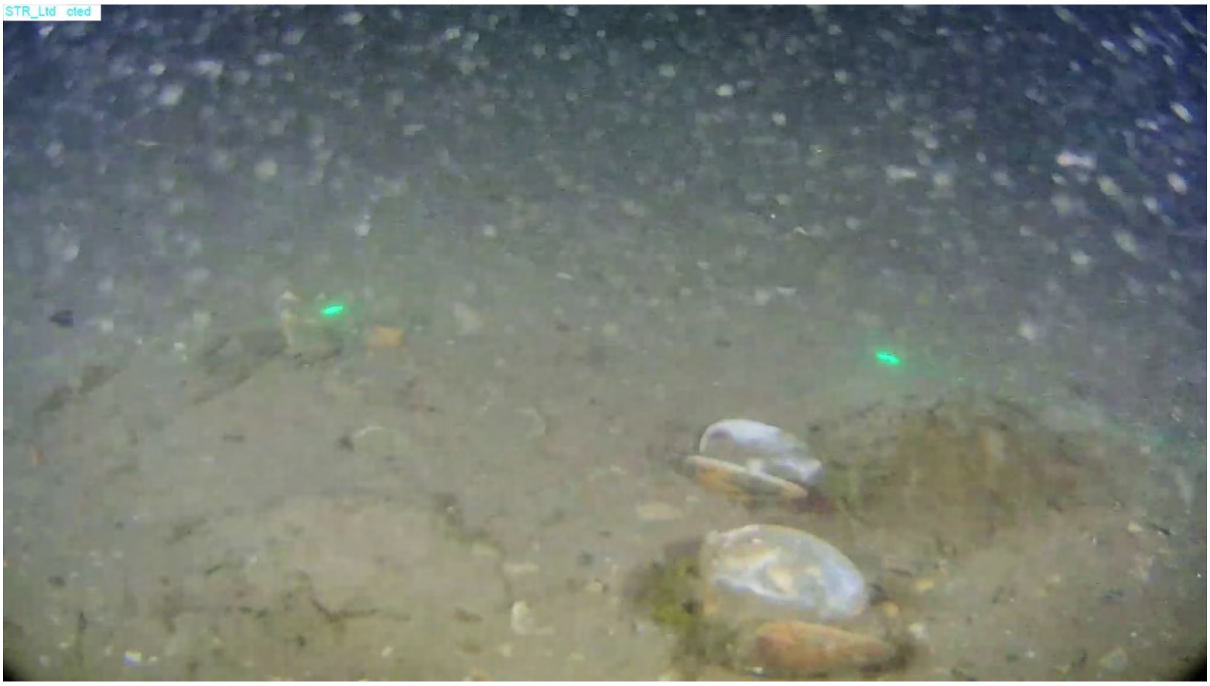

Figure 3-16: Representative video still from station ST 021.

3.1.17 ST 022 Biotope Description:

The transect video at station ST22 was approximately 1 minute and 46 seconds long, with a depth of 10.2 metres (not recorded on video). The site was near a pier pillar and showed a live mussel bed (*Mytilus edulis*) with fine sediment filling the gaps between the mussels. The mussels were old in nature, many covered with barnacles (Balanidae) and broken shells were scattered throughout, indicating predation, likely by green crabs (*Carcinus maenas*) or other bivalve predators. The presence of old, damaged shells suggests a well-established mussel bed with active biological processes, including ongoing predation and sediment deposition.
Biotope Classification: This station appears SS.SBR.SMus.MytSS—*Mytilus edulis* beds on sublittoral sediment, characterised by live mussel beds creating biogenic structures, supporting diverse benthic organisms and stabilising sediment.

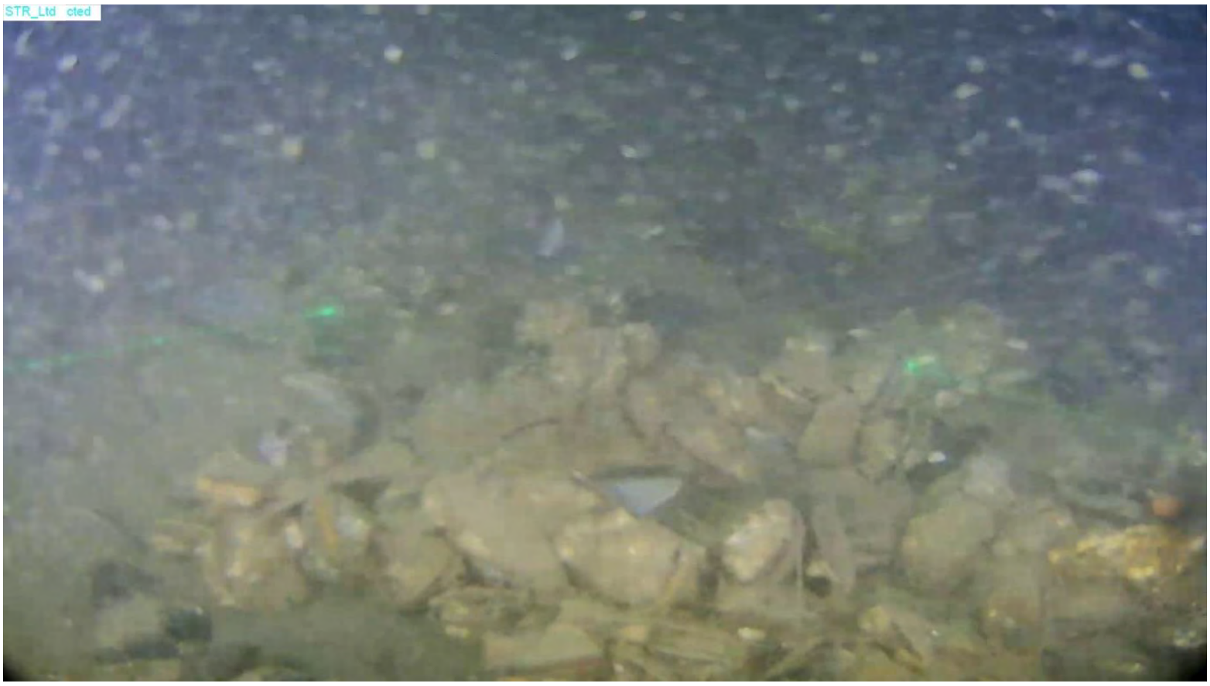

Figure 3-17: Representative video still from station ST 022.

3.1.18 ST 024 Biotope Description:

The transect video at station ST24 was 1 minute and 37 seconds long, with a depth of 6 metres. The water column had a green hue, and the seabed was covered in stones and barnacles. A live mussel reef, along with broken shell fragments, was present. The mussel shells had epifaunal covering of calcareous worms (Serpulidae). The site also included a man-made structure fouled with orange sponges (possibly *Cliona celata*) and brown seaweed *Fucus serratus,* typically found around the lower intertidal area of a shore.

Biotope Classification: SS.SBR.SMus.MytSS—*Mytilus edulis* beds on sublittoral sediment, characterised by the live mussel bed, shell fragments, and the influence of artificial structures.

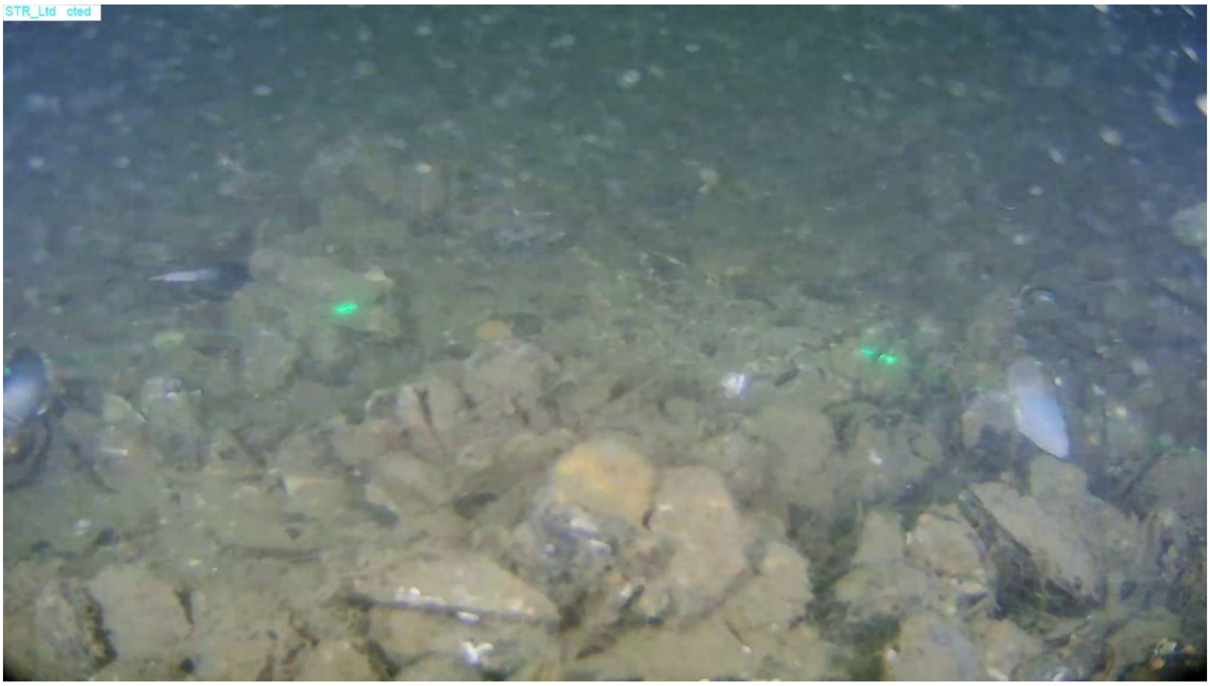

Figure 3-18: Representative video still from station ST 024.

3.1.19 ST 025 Biotope Description:

The transect video at station ST25 was 2 minutes and 15 seconds long. The depth at this station was recorded as approximately 10 metres below chart datum. The substrate consisted of mud and rocky material with gravelly stones and bivalve shells. Filamentous brown algae were observed attached to the rocks, along with a large purple sea squirt (Ascidiacea). The seabed supported a diverse habitat, including orange sponges, green crabs (*Carcinus maenas*), calcareous worms (Serpulidae), and barnacles, with a possible sighting of a harbour crab (*Polybius depurator*). A jellyfish was briefly observed in the water column.

The stones and shell debris provided interstitial spaces, offering shelter and attachment points for epifauna. Suspended particulate matter in the water column suggests some disturbance, likely from tidal currents.

Biotope classification: This station likely corresponds with the IR.LIR.K biotope – silted kelp communities on infralittoral rock, or IR.LIR.IFaVS – faunal communities on variable salinity infralittoral rock. The observed species and substrate suggest a low to moderate energy infralittoral rocky environment.

Figure 3-19: Representative video still from station ST 025.

3.1.20 ST 026 Biotope Description:

The transect video at station ST26 was 2 minutes long. The depth at this station was recorded as approximately 14.5 metres below chart datum. The substrate consisted of soft mud with scattered shell fragments and patches of brown and green algae. A species observed was the common starfish (*Asterias rubens*), which was present on the substrate.

The seafloor appeared to be a low-energy environment, with fine mud and occasional coarser materials such as shell fragments and small rocks.

The presence of shell and organic debris contributed to the habitat's structural complexity, providing microhabitats for small benthic organisms, even though larger fauna was not immediately visible in the frame.

Biotope classification: This station corresponds with the SS.SMu.CSaMu biotope – Circalittoral sandy mud, characterised by fine mud and the presence of scattered shell and organic material. The low-energy environment and occasional disturbances shape the habitat, supporting species such as *Asterias rubens* and providing ecological niches for small benthic organisms.

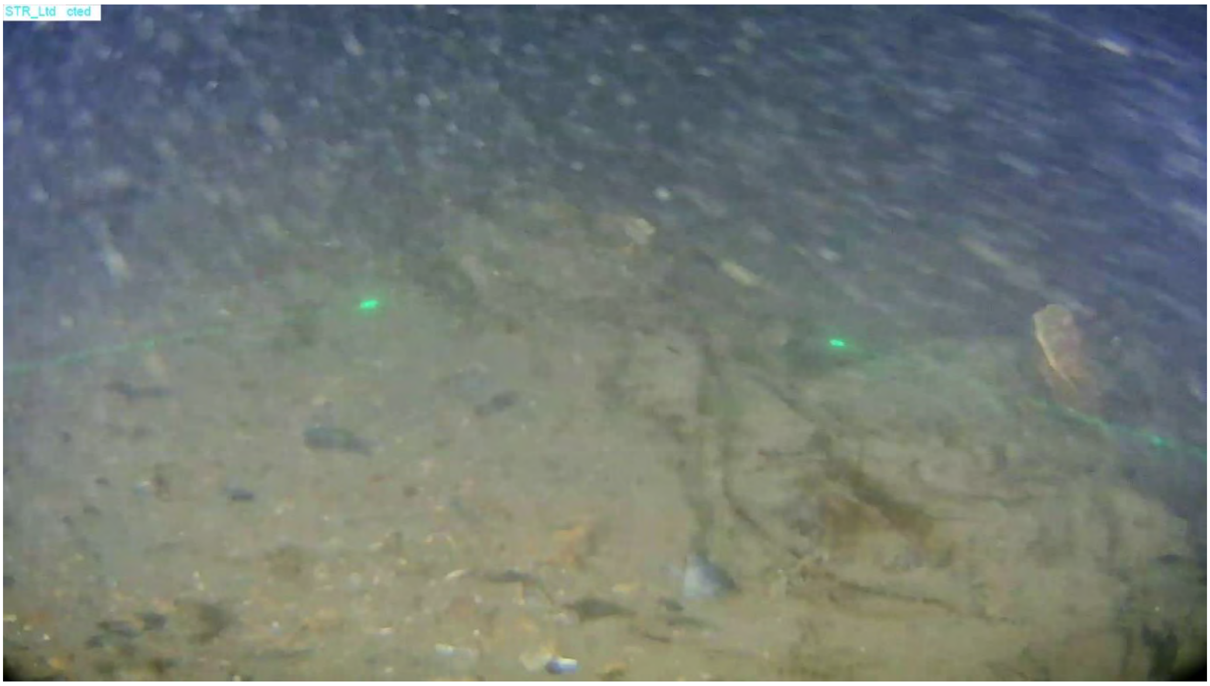

Figure 3-20: Representative video still from station ST 026.

3.1.21 ST 027 Biotope Description:

The transect video at station ST27 was approximately 2 minutes long. The depth at this station is recorded as approximately 14.5 metres below chart datum. The substrate consisted of soft mud mixed with numerous shell fragments, indicating a dynamic environment. The seabed showed evidence of regular disturbances, as visible suspended particulate matter was observed in the water column, likely from tidal movements or other influences.

The shell fragments scattered across the seafloor suggest the presence of bivalves or other molluscs, contributing to the structural complexity of the habitat.

Biotope classification: This station appears to be SS.SMu.CSaMu biotope – Circalittoral sandy mud, characterised by soft muddy sediment with occasional coarser materials. The regular disturbances and presence of shell debris suggest an environment that supports various benthic species, contributing to the biodiversity of the area.

Figure 3-21: Representative video still from station ST 027.

3.1.22 ST 028 Biotope Description:

The transect video at station ST28 was 2 minutes long. The depth at this station is recorded as approximately 16 metres. The substrate consisted of soft mud and fine silt, characteristic of a low-energy environment where fine particles can settle. However, strong currents were present, and the boat maintained a speed of 3 knots.

The water column contained a significant amount of suspended particulate matter, likely stirred up by the strong current and boat movement. No large visible flora or fauna were observed in the image, possibly due to the current or the organisms being burrowed into the sediment.

Biotope classification: This station has the characteristics of SS.SMu.CSaMu biotope – Circalittoral sandy mud, characterised by fine muddy sediments and strong current influences.

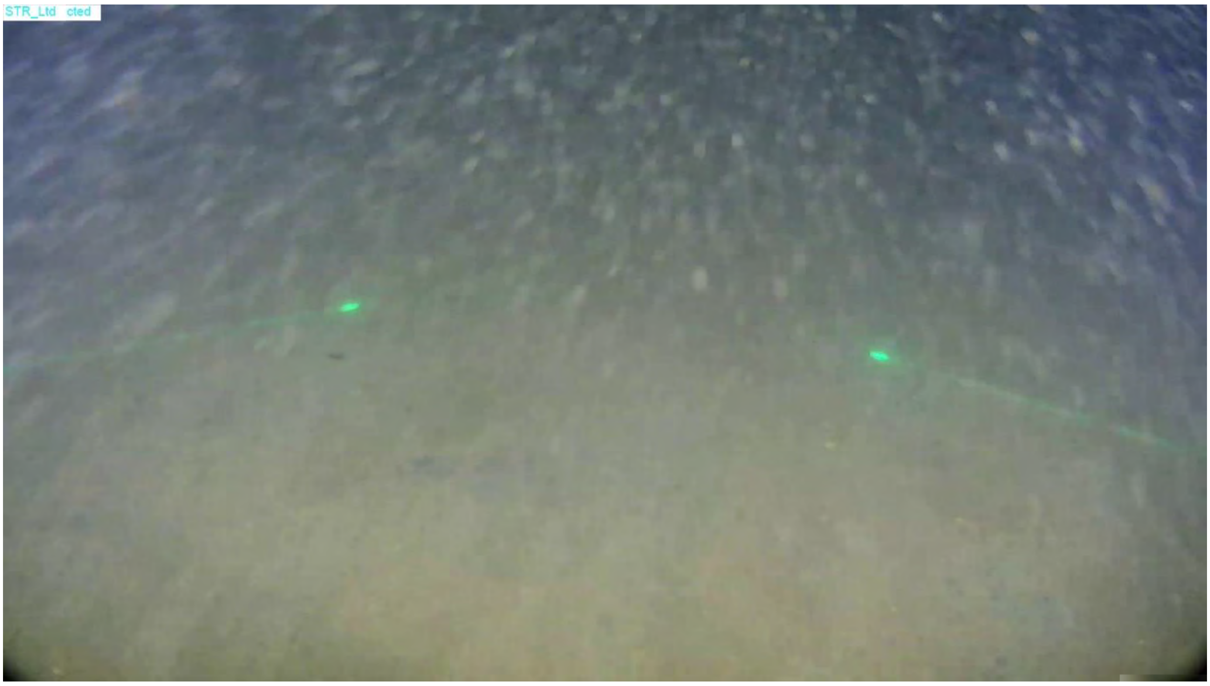

Figure 3-22: Representative video still from station ST 028.

3.2 Summary of Benthic Marine Environments Observed using DDV in 2024:

The 2024 DDV survey revealed a range of biotopes primarily associated with subtidal sedimentary environments. Infralittoral sandy mud (SS.SSa.IMuSa and SS.SMu.ISaMu) were common biotopes at many stations, with fine muddy sand characterising the low-energy environments. *Mytilus edulis* beds (SS.SBR.SMus.MytSS) were observed at several sites, indicating biogenic reef aggregations on sublittoral sediments. At a number of stations infralittoral mixed sediment (SS.SMx.IMx) were observed. Additional habitats identified infralittoral fine mud (SS.SMu.IFiMu), *Saccharina latissima* and red seaweeds (SS.SMp.KSwSS.SlatR), and circalittoral sandy mud (SS.SMu.CSaMu) characterised by fine silts, shell fragments, and organic materials.

General Observations:

Across the stations, a range of taxa were observed, reflecting the diversity of habitats. Crabs (*Carcinus maenas* and *Polybius depurator*) were among the most frequently observed species, often seen foraging or burrowing. Bivalves (*Mytilus edulis* and *Cerastoderma edule*) and were seen at several stations, contributing to the structural complexity of the seabed. Algae, particularly *Saccharina* *latissima* and *Ulva spp.*, were observed at several stations but in some cases, these may have been detrital in nature. A variety of fish species were also observed, including gobies (*Gobius* spp.), dragonets (*Callionymus* spp.), a wrasse (Labridae spp.), and a squid (*Teuthida* spp.).

Table 3-2: Summary of Faunal Species recorded in 2024.

Station	Faunal Species 2024
ST01	None recorded
ST02	*Carcinus maenas* (green shore crab)
ST03	*Mytilus edulis*
ST04	*Mytilus edulis, Polybius depurator* (harbour crab) Porifera (sponges)
ST05	*Mya arenaria, Polybius depurator* (harbor crab)
ST08	Bivalvia (possible mussels)
ST09	Carcinus maenas (green crab)
ST11	*Carcinus maenas* (green crab)
ST13	*Polybius depurator* (harbour crab)
ST15	*Gobius niger* (goby) *Callionymus lyra* (dragonet)
ST16	None observed
ST17	*Gobius niger* (goby) *Callionymus lyra* (dragonet)
ST18	None recorded
ST19	*Carcinus maenas* (green crab) *Mya arenaria* (clam) *Cerastoderma edule* (cockle)
ST20	*Necora puber* (velvet crab) Gobius sp. (goby) *Mytilus edulis* (mussel)
ST21	*Carcinus maenas* (green crab) Shell fragments ,
ST22	*Mytilus edulis* (live mussel bed) Balanus spp. (barnacles)
ST24	*Mytilus edulis*, Balanus spp. (barnacles) *Cliona celata* (sponge)
ST25	*Mytilus edulis, Carcinus maenas* (green crab) Scyphozoa (jellyfish) Porifera (sponges)
ST26	*Asterias rubens* (common starfish)
ST27	*Mytilus edulis* Shell fragments Bivalvia (bivalves)
ST28	None observed

4. Discussion

In 2024 there were 27 locations visited. The of the biotope classifications recorded during the 2024 survey is provided in Table 4-1. Full descriptions of all JNCC biotopes can be found on the Marine Life Information Network (MarLIN) website Home - MarLIN - The Marine Life Information Network.

Table 4-1: Biotope classification in 2024

Station	Biotope Classification 2024
ST01	Infralittoral Sandy Mud habitat complex [SS.SSa.IMuSa] Infralittoral sandy mud SS.SMu.ISaMu
ST02	Infralittoral Sandy Mud habitat complex [SS.SMu.ISaMu], Circalittoral mixed sediment [SS.SMx.CMx]
ST03	Infralittoral Sandy Mud habitat complex [SS.SMu.ISaMu]
ST04	*Mytilus edulis* beds on sublittoral sediment SS.SBR.SMus.MytSS - Infralittoral Sandy Mud habitat complex [SS.SMu.ISaMu]
ST05	Infralittoral Sandy Mud habitat complex [SS.SMu.ISaMu]
ST08	Infralittoral muddy sand [SS.SSa.IMuSa] *Saccharina latissima* and red seaweeds on infralittoral sediments [SS.SMp.KSwSS.SlatR]
ST09	Infralittoral fine mud [SS.SMu.IFiMu]
ST11	Infralittoral muddy sand [SS.SSa.IMuSa]
ST13	Infralittoral fine mud [SS.SMu.IFiMu]
ST15	Infralittoral muddy sand [SS.SSa.IMuSa]
ST16	Infralittoral fine mud [SS.SMu.IFiMu] Characterised by fine silt, low energy [SS.SMu.CSaMu]
ST17	Infralittoral fine mud [SS.SMu.IFiMu] *Saccharina latissima* (if attached) [SS.SMp.KSwSS.SlatR]
ST18	Infralittoral mixed sediment [SS.SMx.IMx]
ST19	Infralittoral mixed sediment [SS.SMx.IMx]
ST20	Shell/Mussel-bed habitat complex [SS.SMx.IMx]
ST21	Shell/Mussel-bed habitat complex [SS.SMx.IMx]
ST22	*Mytilus edulis* beds on sublittoral sediment [SS.SBR.SMus.MytSS]
ST24	*Mytilus edulis* beds on sublittoral sediment [SS.SBR.SMus.MytSS]

Station	Biotope Classification 2024
ST25	Faunal communities on variable salinity infralittoral rock [IR.LIR.IFaVS] Sublittoral biogenic reefs [SS.SBR]
ST26	Circalittoral sandy mud, characterised by fine mud and the presence of scattered shell and organic material [SS.SMu.CSaMu]
ST27	Circalittoral sandy mud, characterised by soft muddy sediment with occasional coarser materials [SS.SMu.CSaMu].
ST28	Circalittoral sandy mud, characterised by fine muddy sediments and strong current influences [SS.SMu.CSaMu].

The predominant habitat types across these locations consisted of relatively homogeneous, featureless muddy sands. Occasionally, burrowing anemones and crabs were observed on the sediment surface. This habitat type was classified as the Infralittoral Sandy Mud habitat complex [SS.SMu.ISaMu], following the JNCC classification guidelines. The video evidence supported the conclusions drawn from faunal and granulometric assessments conducted during the grab survey at the time, which also identified the same habitat type within the Ringaskiddy Basin.

There was a diversity in substrate and ecological communities across the infralittoral and circalittoral environments, ranging from mixed sediments and biogenic reefs to fine muddy areas with unique faunal communities.

5. Conclusion

Infralittoral Sandy Mud habitats (SS.SSa.IMuSa and SS.SMu.ISaMu) were common across many stations observed, particularly ST01, ST02, ST03, ST04, ST05, ST08, ST11, ST15, and ST20. These habitats are typical for low energy, infralittoral zones. *Mytilus edulis* (blue mussel) beds on sublittoral sediment were seen at ST04, ST22, and ST24, indicating biogenic reefs where mussels play a prominent role. Infralittoral Fine Mud habitats (SS.SMu.IFiMu) are present in stations such as ST09, ST13, ST16, and ST17, characterised by finer sediments and low energy environments. Some of these locations include specific features, such as low-energy environments with fine silt in ST16. *Saccharina latissima* occurred on infralittoral sediment at ST08 and at ST17 but this may be detrital in nature. Shell/Mussel-bed complexes are reported at ST20 and ST21, representing areas with a dominance of shells or mussel beds. Circalittoral Sandy Mud (SS.SMu.CSaMu) habitats were seen at stations ST26, ST27, and ST28, characterized by fine muddy sediments, often with scattered shells, organic material, and, in some locations, influenced by strong currents.

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AYESA (Port of Cork)

Fish, Fisheries & Aquaculture Desk Study

Ringaskiddy, Cork Harbour

Client: AYESA (Port of Cork)

Reference no: **P15494**

Date of issue: **18/11/2024**

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Report Approval Sheet

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AQUAFACT
APEM Group

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ABP	An Bord Pleanála
BIM	Bord Iascaigh Mhara
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DAFM	Department of Agriculture, Food and Marine
EU	European Union
NPWS	National Parks and Wildlife Service
QI	Qualifying Interest
SAC	Special Area of Conservation
SCI	Special Conservation Interest
SPA	Special Protection Area
S-P-R	Source-Pathway-Receptor
ZoI	Zone of Influence

1. Introduction

1.1. Overview

This desk-based baseline survey for fish/shellfish in the Ringaskiddy area has been prepared by AQUAFACT - APEM Group to provide relevant information to support the assessment of environmental effects on the marine and coastal environment associated with the proposed development at the port. This baseline report sets out significant fish/shellfish that have the potential to be present in the area to inform whether mitigation should be advised during the environmental assessment process prior to construction.

This study focuses on the maritime area near the proposed redevelopment of Ringaskiddy Figure 1-1. The remaining redevelopment at Ringaskiddy involves several key construction elements across multiple sites and are summarised below (also see redline boundaries Figure 1-1).

Ringaskiddy East (Container and Multi-purpose Berth (CB/MPB)):

A Container Berth of approximately 200m in length (Cork Container Terminal -CCT 2)

Dredging of the seabed to a level of -13.0 m Chart Datum (CD)

Installation of link-span comprising a floating pontoon and access bridge

Installation of container handling cranes

Lighting and fencing

Ringaskiddy West (Deepwater Berth Extension):

A new 182m extension to the existing Deepwater Berth (DWB) which will comprise a filled quay structure (of approximately 231m) extending no further seaward than the edge of the existing DWB

Dredging works to varying levels to facilitate navigational access to the new facilities

Lighting

Road Improvements:

Improvements to internal road network at Ringaskiddy East to facilitate future access to the N28:

Lighting and fencing

The redevelopment also features Load on Load off (LoLo), Roll on and Roll off (RoRo), and general cargo operations, with specific quay structures, surfacing, and reclamation works. Key services such as drainage, lighting, and security systems will be installed to ensure the safe and efficient operation of the terminal.

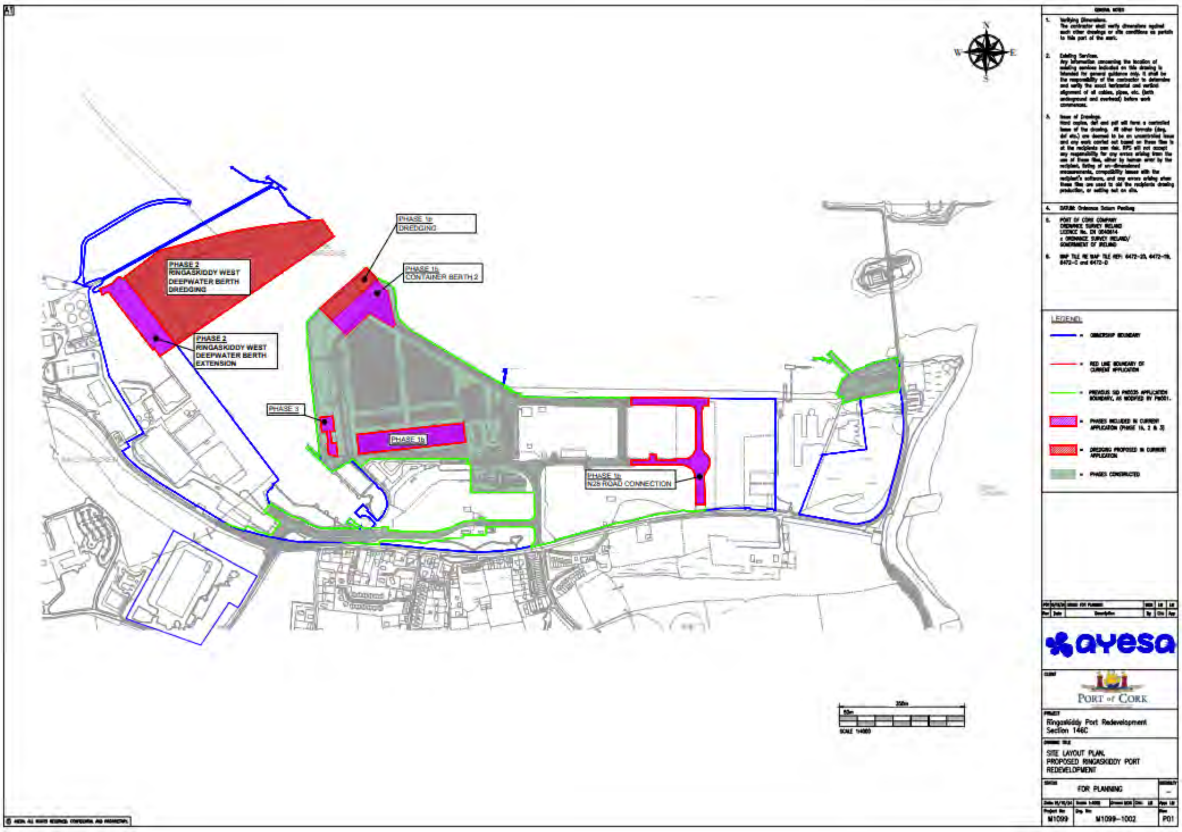


Figure 1-1: Ringaskiddy project area.

This baseline desk study reviews the aquaculture, fishing activities and fish/shellfish species found around Ringaskiddy. Ireland's Marine Atlas[1] was used to identify commercial fisheries and related considerations, the Department of Agriculture Food and the Marine (DAFM)[2] was also consulted to obtain details on fishery orders/ shellfish waters, while the National Biodiversity Data Centre[3] (was consulted to document species of interest identified at sites along the shore.

This assessment includes an assessment of available records of fish in the Ringaskiddy area including the following sources:

- Conservation status assessment reports, backing documents and maps prepared to inform national reporting required under Article 17 of the Habitats Directive.
- Site synopsis, conservation objective reports and Natura 2000 forms available from NPWS.
- Published and unpublished NPWS reports on protected habitats and species including Irish Wildlife Manual reports, species action plans and conservation management plans.
- Existing relevant mapping and databases *e.g.* waterbody status, species and habitat distribution, *etc.* (sourced from the National Biodiversity Data Centre (NBDC)[4] and the NPWS[5]).

Ireland’s Marine Atlas supports national reporting for the European Commission’s Marine Strategy Framework Directive on the environmental status of the surrounding seas and oceans. Ireland’s Marine Atlas features a variety of content that includes administrative boundaries, protected sites, oil and gas, oceanographic features, fisheries and aquaculture, marine monitoring, seabed habitats, tourism and leisure, transport, infrastructure, discharge point sources, International Maritime Organisation protected areas, and current/historical dumping sites.

The National Biodiversity Data Centre, objectives are to acquire, collate, manage, validate, and make available data concerning Ireland's biodiversity. This documents wildlife resources and monitors changes over time, supporting national initiatives to maintain and enhance biodiversity. This includes recording species and habitat information related to terrestrial, freshwater, marine, river, and wetland environments.

1.2. Statement of Authority

Dr Ronan Browne is the Head of Consultancy at AQUAFACT. He has an extensive background in fisheries and aquaculture, with a strong academic foundation including a PhD on the European clawed lobster *H. gammarus*, fisheries practices and resource management from NUIG, as well as an MSc in Shellfish Biology, Fisheries, and Culture from Bangor University, Wales, and a National Diploma in Aquatic Biology from Galway Regional Technical College. His practical experience in the industry is equally relevant, having worked as a Fishery Assessment Technician for the Marine Institute, monitoring inshore fisheries, trawler-based discards species and catch assessment. He has conducted surveys and prepared reports on native oyster, cockles and scallop beds, and contributed to many national review publications on Irish aquaculture. Ronan's experience extends to education and training, having delivered fish and shellfish hatchery courses for BIM/FETAC. Additionally, his background includes roles such as a Marine Research Coordinator at MRI Carna Research Labs, post-doctoral work on cod hatchery rearing, and served as a Regional Aquaculture Officer for Taighde Mara Teo in Galway and Donegal.

2. Desk Study

There are over 563 marine fish found around Ireland. Some 245 species are found inshore (<200m depth) (130 exclusively inshore) and 435 species offshore (>200m depth) (321 exclusively offshore). Approximately 65 fish species in transitional waters are being monitored through the Water Framework Directive Fish Monitoring Programme (Inland Fisheries Ireland).

Annex II marine fish species which can occur around Ireland are:

1095 Sea lamprey [*Petromyzon marinus*]

1099 River lamprey [*Lampetra fluviatilis*]

1103 Twaite shad [*Alosa fallax*]

1106 Atlantic salmon [*Salmo salar*]

(Source: https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17/2019/species/fish)

Sea Lamprey (*Petromyzon marinus*) and River Lamprey (*Lampetra fluviatilis*): Both the sea and river lamprey are anadromous, spending part of their lives in freshwater before migrating to the sea. Sea lamprey is listed as near threatened in Ireland but of least concern globally, while river lamprey is least concern on both lists (King *et al*., 2011; IUCN, 2021). Population declines have been linked to overharvesting and habitat disruption, particularly due to man-made barriers (Igoe *et al*., 2004). Sea lampreys in the River Ulla, for instance, experience significant delays due to such obstacles (Silva *et al*., 2019). Both species spawn in fast-flowing rivers with gravel beds, and after a single spawning event, they die (Bracken *et al*., 2018). Key habitats in Ireland include the Shannon, Suir, Nore, Moy, and Corrib rivers, among others.

Twaite Shad (*Alosa fallax*): Twaite shad is an anadromous species of the herring family (Clupeidae) that inhabits the north-eastern Atlantic, ranging from Iceland in the north to Morocco in the south and as far east as the Baltic Sea (Aprahamianr *et al.,* 2003). Globally, it is listed as of least concern on the IUCN Red List (IUCN, 2021), but it is classified as vulnerable on Ireland's Red List (King *et al*., 2011). Adults migrate from the sea into freshwater rivers to spawn between February and June, depending on their geographical location (Davies *et al*., 2020). In Ireland, they spawn in rivers such as the Munster Blackwater and the Barrow-Nore-Suir system (Gallagher *et al*., 2020).

Atlantic Salmon (*Salmo salar*): Atlantic salmon are an anadromous species, migrating from the sea to spawn in freshwater rivers with clean, well-oxygenated gravel beds. They are listed as vulnerable in Europe and Ireland (IUCN, 2021; King *et al*., 2011). River obstacles such as bridges and culverts hinder salmon migration, and their removal would enhance river connectivity (Atkinson *et al.,* 2020). In Ireland, the Shannon River Basin supports healthy juvenile salmon populations, with monitoring showing strong numbers in rivers such as the Feale and Mulkear (Gargan *et al*., 2020).

European Eel (*Anguilla anguilla*): The European eel, found throughout Ireland, is a critically endangered species on the IUCN Red List (IUCN, 2021) and is listed under Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II due to concerns over trade. This catadromous species spends most of its life in freshwater or estuaries before migrating to the Sargasso Sea to spawn (Arai *et al*., 2006). In the River Shannon, eel populations have been affected by hydropower developments, with declines in both juvenile and adult numbers despite past stocking efforts (McCarthy *et al.,* 2008).

2.1. South West Regional Inshore Fisheries Forum (RIF) Overview

The Southwest RIFF area covers the coastal zone of Cork and Kerry, stretching from Youghal in East Cork to the Kerry-Limerick border. Around 32% of the national fishing fleet is based here, with 647 vessels primarily in the polyvalent general, specific, and potting sectors. The key fishing ports include Castletownbere, Cobh, Kinsale, Union Hall, and Dingle. Numerous smaller harbours and piers support both fishing and tourism activities across the region. Fisheries in the area target lobster, brown crab, shrimp, spider crab, crayfish, scallops, *Nephrops*, and whelk, among others, using a variety of gear such as pots, trawls, and nets.

Ireland's Marine Atlas provides various information on the fisheries detailed below and their target various species, such as shown in **Error! Reference source not found.**:

Table 2-1: Fisheries and target species

Bottom trawl: fishing targets mixed demersal species, nephrops (*Nephrops norvegicus*), scallops (*Pecten maximus)* and queen scallops (*Aequipecten opercularis*).
Pot fishing: focuses on brown crab (*Cancer pagurus*), crab (*Carcinus maenas*), lobster (*Homarus gammarus*), velvet crab (*Necora puber*), nephrops (*Nephrops norvegicus*), shrimp (*Palaemon serratus*), spider crab (*Maja squinado*), and whelk (*Buccinum undatum*).
Net fishing: encompasses baitfish (Various species), crayfish, herring (*Clupea harengus*), mixed demersal species (Various species), pollack (*Pollachius pollachius*), cod (*Gadus morhua*), salmon (*Salmo salar*), sprat (*Sprattus sprattus*), turbot (*Scophthalmus maximus*), and wrasse (Labridae).
Dredge fishing: typically involves clam, cockle, mussels, native oysters, razor clams, scallops, seed mussel, and surf clams.
Periwinkle harvesting: is conducted in the intertidal areas of the shore.

2.2. Fishing activities around Ringaskiddy

As part of the desk study, the Sea Fisheries Protection Agency (SFPA) was contacted for updates on information previously provided in the Ringaskiddy NIS. However, the following points were clarified in their response: The SFPA clarified that fishing vessel and aquaculture licensing queries should be directed to the Department of Agriculture, Food and the Marine (DAFM), or Board Iascaigh Mhara (BIM) for specific data. The SFPA does not analyse fisheries like scallops and razor clams, and there is no classification for these species in Cork Harbour, though oysters are classified, and a mussel classification is dormant. The SFPA also can no longer provide public insights on developments like Ringaskiddy, as this falls under the EIAR process, requiring input from qualified ecologists.

Also, on contacting DAFM they informed us that Sea-fishing Boat licences are not area specific, so the information required is not available to the Licensing Authority. While BIM undertakes an annual survey where aquaculture companies are asked to provide economic and operational details for the year, the data is then grouped by species and submitted to the EU in an aggregated form, ensuring that individual companies or persons cannot be identified.

According to the South West Regional Inshore Fisheries Forum Overview the region's "Licensed Charter" fleet has approximately forty vessels over 10 meters with 4-5 smaller vessels distributed as follows: Cork Harbour Area (Youghal to Kinsale), ten 10-meter boats plus five smaller vessels, with 5 vessels from the Old Head of Kinsale to Castletown while the Kerry Coast has twenty five 10 meter vessels and five smaller vessels.

As mentioned earlier Ireland's Marine Atlas highlights a variety of fishing activities that take place around the coast. These include inshore fishing, periwinkle harvesting, dredging, line fishing, midwater trawling, net fishing, bottom trawling, and pot fishing. Each method of fishing is designed for different marine species and habitats, reflecting the varied fishing practices used by local communities along Ireland's coastline.

Edible periwinkles are found along most Irish coastlines and are primarily harvested for export. There are several sites around the mouth of Cork Harbour and at Whitegate where periwinkles are collected shown as green dots in Figure 2-1 (Source Irelands Marine Atlas).

Ireland's Marine Atlas showed no activity for dredge fishing, line fishing, midwater trawl fishing, nets fishing, or bottom trawl fishing. The only recorded activity was pot fishing within the Cork Harbour area.

In Figure 2-22 it appears that shrimp potting is the primary documented potting activity in Cork Harbour, however for an area the size of Cork harbour it is likely that other potting activities, such as crab and lobster fishing, may also be occurring at lower intensities that are not recorded. (Figure 2-22 source Irelands Marine Atlas).

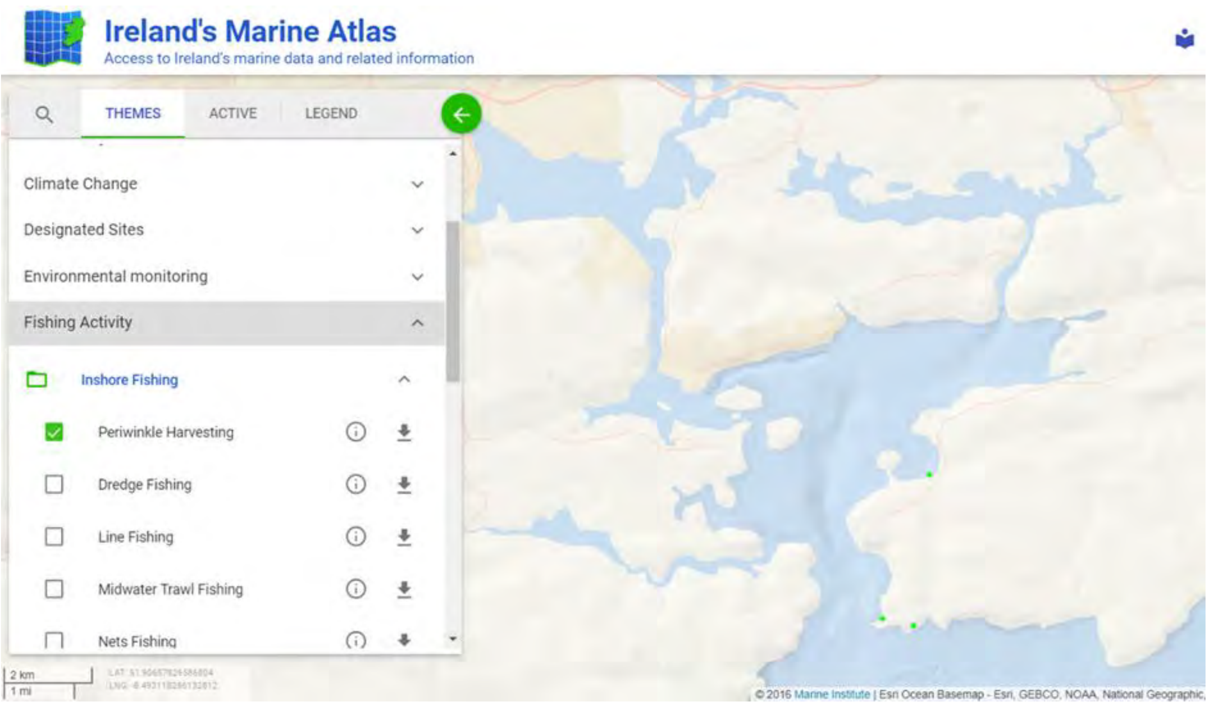


Figure 2-1: Periwinkle harvesting (green dots) (Source Irelands Marine Atlas

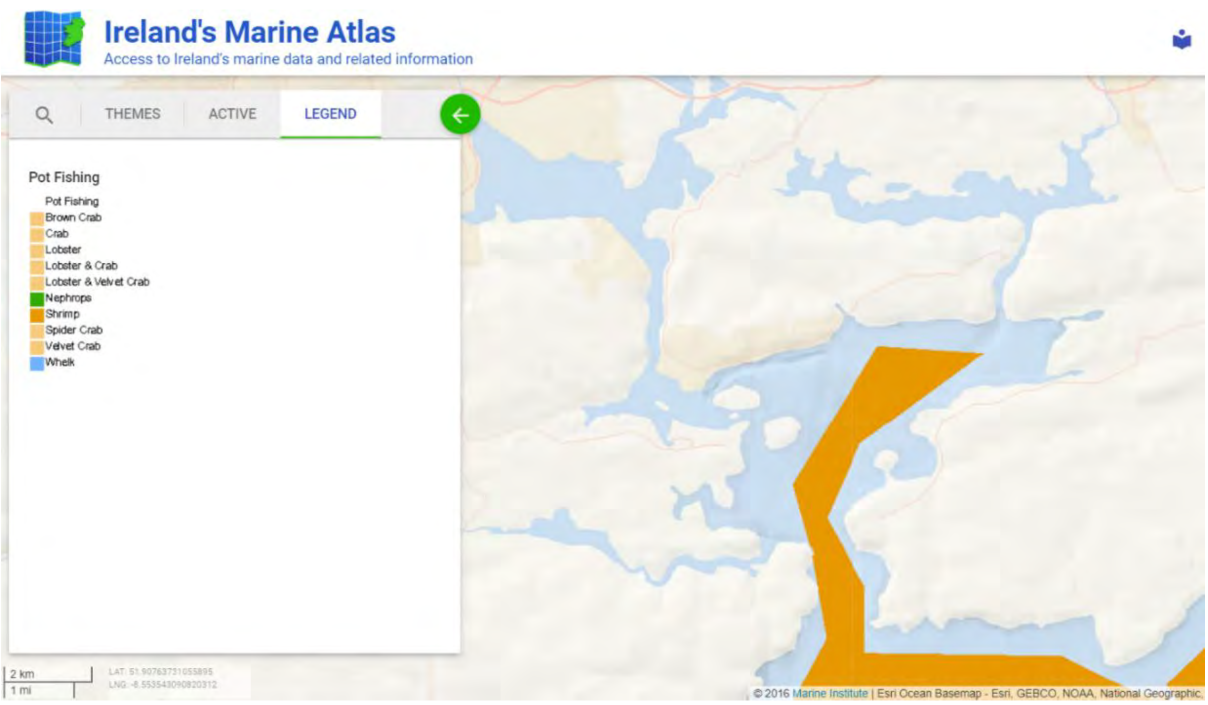


Figure 2-2: Pot fishing for brown crab, lobster, velvet crab, spider crab (light brown colour), shrimp (dark brown) and whelk fishing grounds (blue) (Source Irelands Marine Atlas).

2.3. Commercial Fish Species (nursery and spawning grounds)

The commercial fish, their nurseries, and spawning grounds in Cork Harbour were assessed through Ireland's Marine Atlas (

Table 2-2). The species included in the atlas are blue whiting (*Micromesistius poutassou*), cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), hake (*Merluccius merluccius*), herring (*Clupea harengus*), horse mackerel (*Trachurus trachurus*), mackerel (*Scomber scombrus*), megrim (*Lepidorhombus whiffiagonis*), monkfish (*Lophius piscatorius*), nephrops (*Nephrops norvegicus*), whiting (*Merlangius merlangus*), and salmon (*Salmo salar*).

Table 2-2: Commercial fish species, nursery and spawning grounds.

Species	Nursery Grounds	Spawning Grounds	Nursery & Spawning	Observations
Blue Whiting	None	None	None	None
Cod	Yes	None	None	None
Haddock	None	None	None	None
Hake	None	None	None	None
Herring	Yes	None	None	Wide-ranging
Horse Mackerel	Yes	Not shown	Not shown	Not shown
Mackerel	None	None	None	None
Megrim	None	None	None	None
Monkfish	None	None	None	None
Nephrops	None	None	None	None
Whiting	Yes	Yes	Yes	None
Atlantic Salmon	None	None	None	Entire range

Figure 2-3 depicts cod (*Gadus morhua*) nursery ground (indicated in mustard colour) within Cork Harbour. This data is sourced from the fisheries theme accessed through Ireland's Marine Atlas.

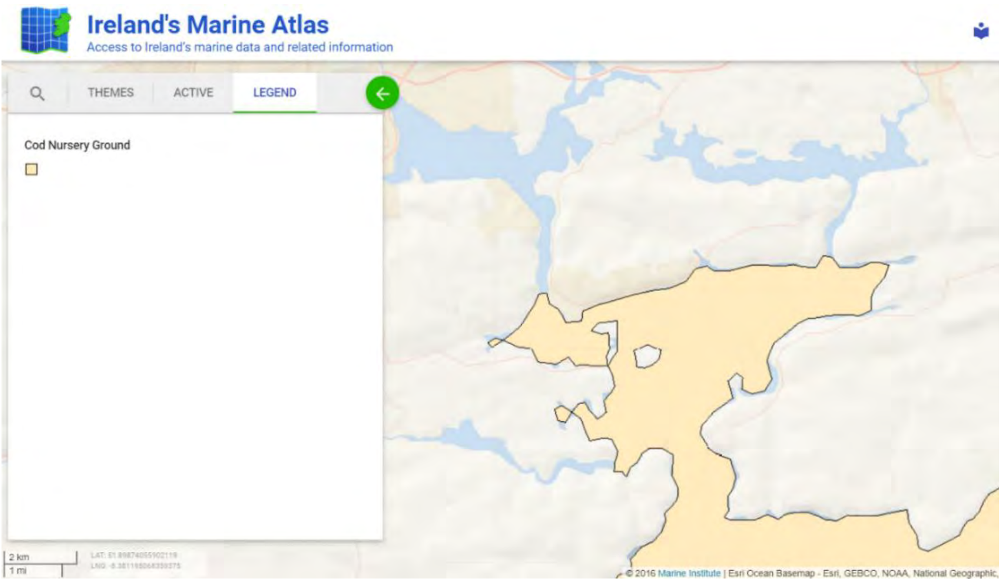


Figure 2-3: Cod (*Gadus morhua*), nursery ground (mustard colour) in Cork Harbour. (Source: Data from the fisheries theme accessed through Ireland's Marine Atlas).

Figure 2-4 shows herring (*Clupea harengus*) nursery grounds (indicated by the saturated blue colour with a bold black outline) inside Cork Harbour. This data is sourced from the fisheries theme accessed through Ireland's Marine Atlas.

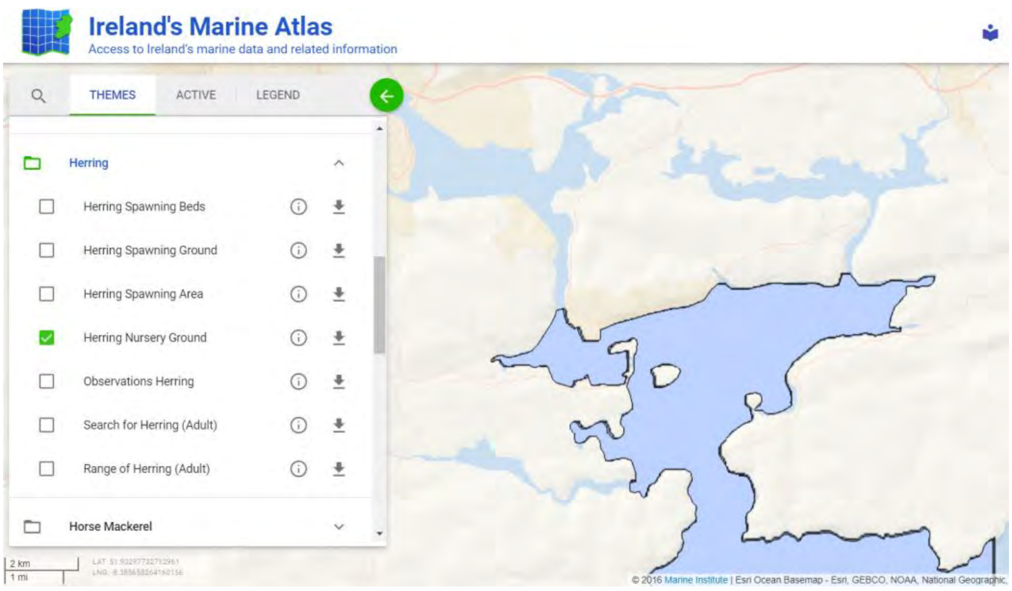


Figure 2-4: Herring (*Clupea harengus*) nursery grounds (blue colour) in Cork Harbour. (Source: Data from the fisheries theme accessed through Ireland's Marine Atlas).

Figure 2-5 depicts the horse mackerel (*Trachurus trachurus*) nursery ground (indicated in pink) in Cork Harbour. This data is sourced from the fisheries theme accessed through Ireland's Marine Atlas.

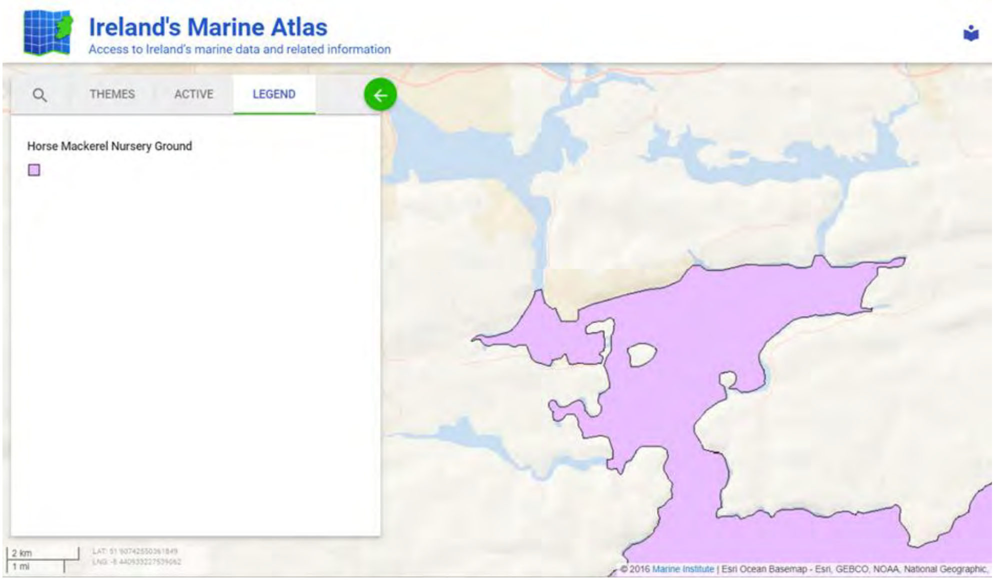


Figure 2-5: Horse mackerel (*Trachurus trachurus*) nursery ground (purple colour) in Cork Harbour. (Source: Data from the fisheries theme accessed through Ireland's Marine Atlas).

Figure 2-6 shows the whiting (*Micromesistius poutassou*) nursery and spawning ground (indicated in pink) in Cork Harbour. This data is sourced from the fisheries theme accessed through Ireland's Marine Atlas.

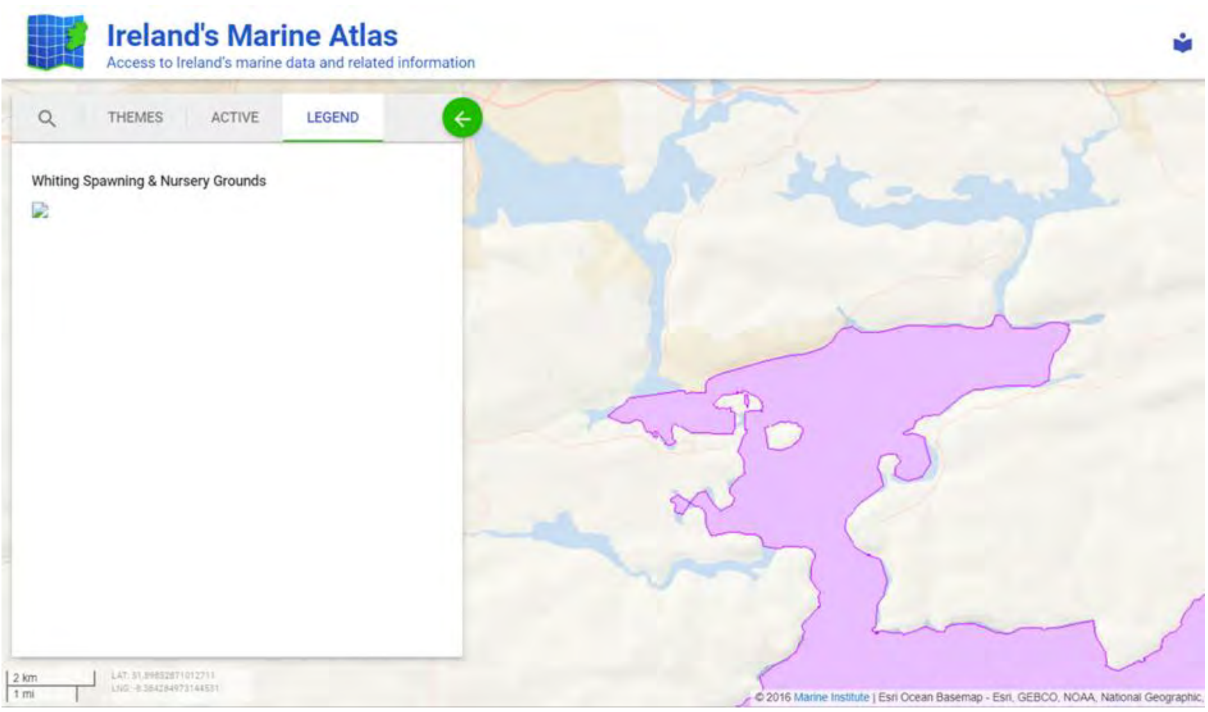


Figure 2-6: Whiting (*Micromesistius poutassou*) nursery and spawning ground (pink colour) in Cork Harbour. (Source: Data from the fisheries theme accessed through Ireland's Marine Atlas).

Figure 2-7 illustrates the range of Wild Atlantic Salmon (*Salmo salar*) (indicated in brown) in Cork Harbour. This data is sourced from the fisheries theme accessed through Ireland's Marine.

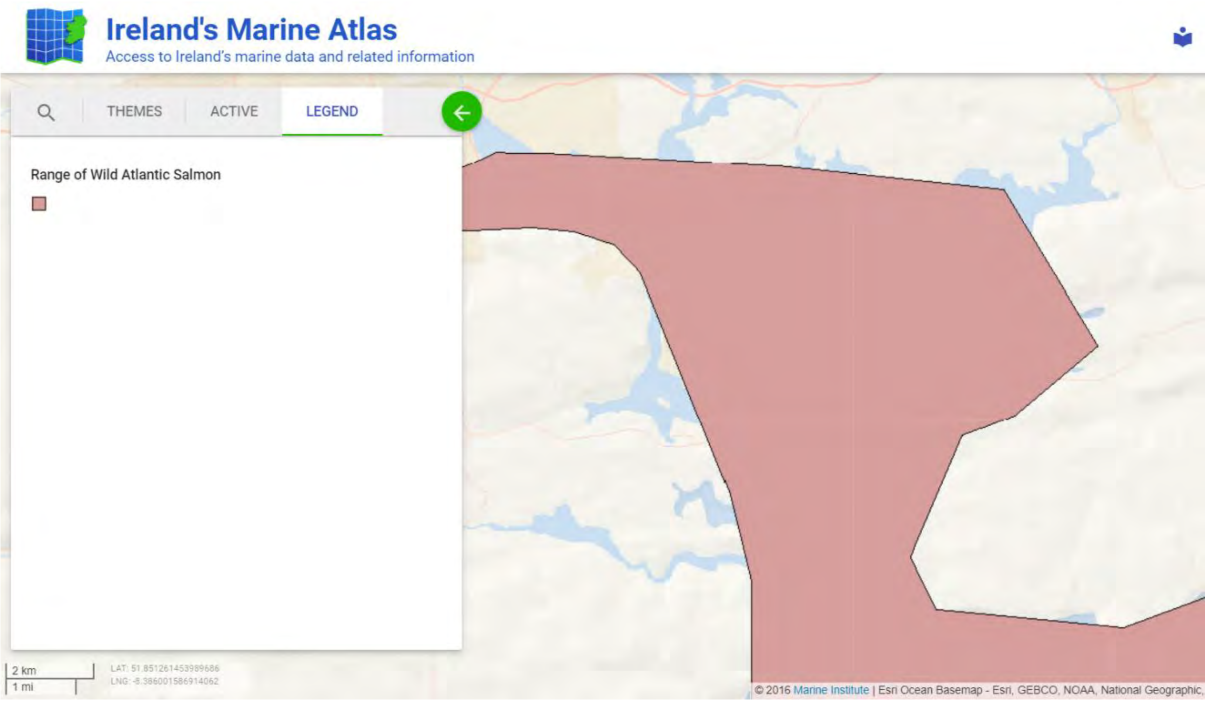


Figure 2-7: Range of Wild Atlantic Salmon (brown colour) in Cork Harbour (Source: Data from the fisheries theme accessed through Ireland's Marine Atlas).

Additional relevant information (Table 2-3: Additional fishery information.) is provided by the South West Regional Inshore Fisheries forum detailing that the fisheries in the South West RIFF area include:

Table 2-3: Additional fishery information.

Broadly prosecuted pot fisheries for Lobster from the River Shannon to east Cork.
Brown Crab pot fishery with high dependency from north Kerry -Tralee Bay south to Kenmare Bay, Castletownbere and east to Youghal.
The Shrimp pot fishery is particularly significant in the South West; Valentia Harbour into Dingle Bay, Kenmare River around into Castletownbere and east to Roaringwater Bay and Ballycotton.
Spider crab is significant top entry pot fishery in north Kerry – Tralee Bay with seasonal fisheries in other areas.
Crayfish are caught both by tangle-netting from north Kerry to east Cork. There is a significant bycatch to the top entry pot fishery in Tralee Bay.
Scalloping occurs off the Blasket Islands and in the Kenmare River, Valentia Harbour, Bere Island Harbour and Bantry Bay, also a limited dredge fishery on the south coast around the Stag rocks and in Roaringwater Bay. Shading/poling harvest of scallop also occurs.
Nephrops pot fishery in Bantry Bay and Kenmare River.
Green crab fishery around Cromane and in Cork particularly in Roaringwater and Bantry Bays.
Velvet crab pot fishery.
Whelk pot fishery – Roaringwater Bay and small fishery in Tralee bay.
Inshore trawling occurs in Dingle Bay predominantly with some also occurring in Tralee Bay and North of the Kerry Head shoals. Fintan's Bay in the Kenmare River provide some towing areas also. In Cork inshore trawling occurs along the south coast from Bantry Bay to Youghal, – *Nephrops* and mixed Demersal fishery.
Hook & line fisheries including trolling and jigging for whitefish occur all along the coast.
Mackerel gillnet fishery – Garnish.
Gillnetting for demersal species.

2.4. Migratory fish

Migratory fish species for consideration designated under Annex II of the Habitats Directive include:

Salmo salar (Atlantic salmon)

Lampetra fluviatilis (River lamprey)

Petromyzon marinus (Sea lamprey)

Alosa fallax (Twaite shad)

The Irish SACs for designated for Annex II migratory fish species are listed in Table 2-12.

Atlantic salmon (*Salmo salar*) is a protected species in freshwater under Annex II of the Habitats Directive (92/43/EEC). Salmon are protected by conservation measures under the EU Freshwater Fish Directive (78/659/EEC), which was transposed into Irish law in 1988 through the European Communities Regulation on Quality of Salmonid Waters (S.I. No. 293/1988).

Under S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988, Water Framework Directive (WFD) River Network Routes were designated as Designated Salmonid Waters. The Council Directive 78/659/EEC of 18 July 1978 on the quality of fresh waters needing protection or improvement to support fish life, and the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, were transposed into Irish law under the Fish Directive S.I. 293/1988 and Habitats Directive S.I. 477/2011.

This legislation requires that salmonid waters must sustain their natural populations of Atlantic salmon, sea trout/brown trout (*Salmo trutta*), char (*Salvelinus*), and whitefish (*Coregonus*).

2.5. Selected fish species recorded by the National Biodiversity Centre (finfish/ shellfish) around Cork Harbour.

Table 2-4 presents a list of some of the marine fin fish species that may have a commercial interest at sites (W76, W76X) in Cork Harbour recorded by the National Biodiversity Data Centre.

Table 2-4: Fish species with a commercial interest (NBD, 2024).

Flounder (*Platichthys flesus*)
Horse Mackerel (*Trachurus trachurus*)

Table 2-5 presents a list of the shellfish species (bivalve and crustacean) documented by Biodiversity Ireland.

Table 2-5: Some commercial shellfish species recorded (NBD, 2024).

Common Prawn (*Palaemon serratus*)
Common Periwinkle (*Littorina littorea*)
Blue Mussel (*Mytilus edulis*)
Brown Shrimp (*Crangon crangon*)
Cancer pagurus
Green Shore Crab (*Carcinus maenas*)
Buccinum undatum
Common Cockle (*Cerastoderma edule*)
Common Oyster (*Ostrea edulis*)
Common Periwinkle (*Littorina littorea*)
Great Scallop (*Pecten maximus*)
Pod Razor Shell (*Ensis siliqua*)

2.6. Observations of fish/ shellfish "Threatened Species: OSPAR Convention"

Observations of fish and shellfish in the vicinity of Ringaskiddy that are listed as "Threatened Species" under the OSPAR Convention" listed by Biodiversity Ireland are shown in Table 2-6. The number of recorded sightings of the following species are: (1) dog whelk (*Nucella lapillus*), (1) thornback ray (*Raja clavate*), (1) Common Oyster (*Ostrea edulis*) and (3) European Eel (*Anguilla anguilla*). These were observed within sites W76X and W76X. However it is important to note that the absence of records for a particular species in an area does not confirm the absence of that species, as not all sightings or data may have been reported or uploaded.

Table 2-6: Significant shellfish species (NBD, 2024).

Species group	Species name	Record count	Date of last record	Title of dataset	Site
bony fish (Actinopterygii)	European Eel (*Anguilla anguilla*)	3	08/10/2008	River Biologists' Database (EPA)	W76
mollusc	Common Oyster (*Ostrea edulis*)	1	06/03/2020	Explore Your Shore	W76X
cartilagenous fish (Chondrichthyes)	Thornback Ray (*Raja clavata*)	1	31/08/1977	Rare marine fishes taken in Irish waters from 1786 to 2008	W76
mollusc	Dog Whelk (*Nucella lapillus*)	1	14/01/2020	Explore Your Shore	W76X

2.7. Marine Leisure (Fishing)

It is reported thar recreational sea angling in Cork Harbour offers a variety of hotspots, including Ballybranigan Beach, Inch Beach, Roches Point, and White Bay, where species such as bass, cod, flounder, and mackerel can be caught. Charter boats, provide deep-sea and shark fishing trips, targeting blue sharks, ling, pollack, and conger eel. Popular pier and shore fishing locations include Aghada Pier and Lynch's Quay, known for catches of bass, dogfish, and thornback ray. Several slipways, including those at Gyleen, Rostellan, and Crosshaven, make boat launching easy for anglers.

2.8. Aquaculture

Within Cork Harbour, there are two licensed aquaculture sites: one for mussels (T05-522B) and another for Pacific oysters and brown seaweed (T05-294A) (Figure 2-8, Table 2-7).

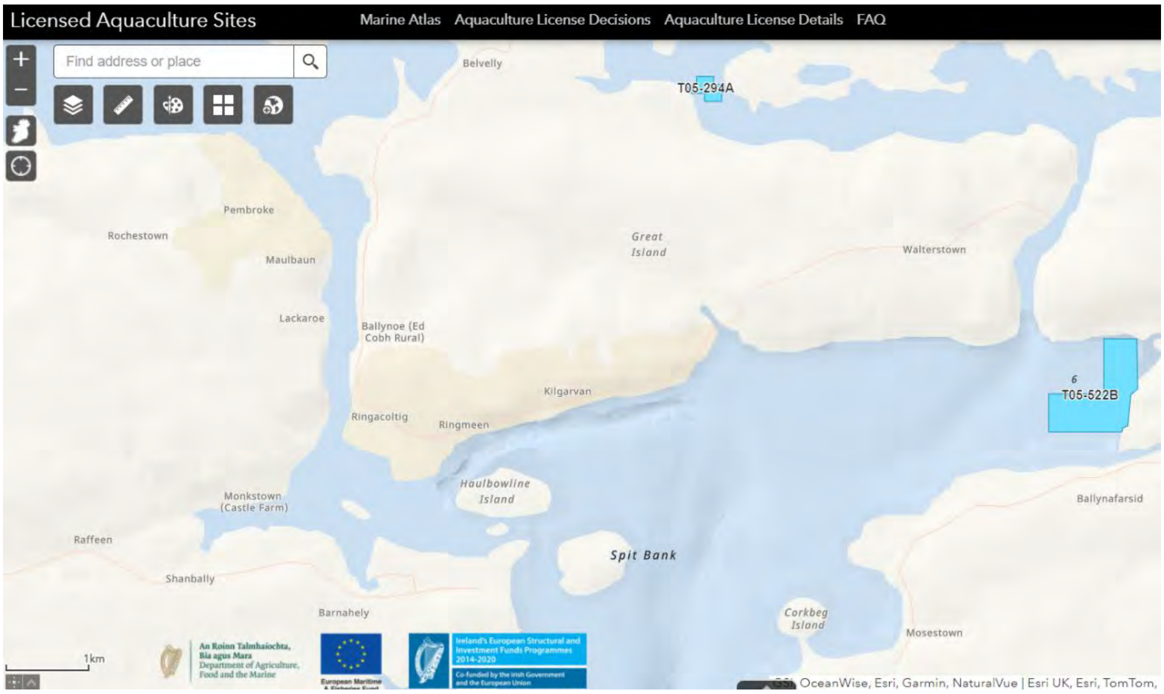


Figure 2-8: Licensed aquaculture sites (T05-522B, T05-294A) in Cork Harbour (https://dafm-maps.marine.ie/aquaculture-viewer/).

Table 2-7: Aquaculture sites, licensed species and site references (source https://dafm-maps.marine.ie/aquaculture-viewer/)

Aquaculture sites	Species	Site Reference
Bivalve and algae	Blue Mussel	T05-522B
	Pacific Oyster, Brown seaweed	T05-294A

In Cork Harbour there are two Fishery Orders are in place, one for blue mussels (Rostellan T05-002OFO) and the other for European flat oysters (T05-017OFO) (Figure 2-9, Table 2-8).

Figure 2-9: Fishery orders in Cork Harbour (T05-002OFO and T05-017OFO) (source: https://dafm-maps.marine.ie/aquaculture-viewer/).

Table 2-8: Fishery Orders, species and site reference (source https://dafm-maps.marine.ie/aquaculture-viewer/)

Fishery Order	Species	Site Reference
Bivalve	Blue Mussel (Rostellan South, North, West) 926 ha.	T05-002OFO
	European Flat Oyster 129.14 ha.	T05-017OFO

There are also four protected sites, designated under the Shellfish Water Directive: Cork Great Island North Channel (T05-294A), and Rostellan West, South, and North (T05-522B, T05_522B, T05-522B) (Figure 2-10, Table 2-9).

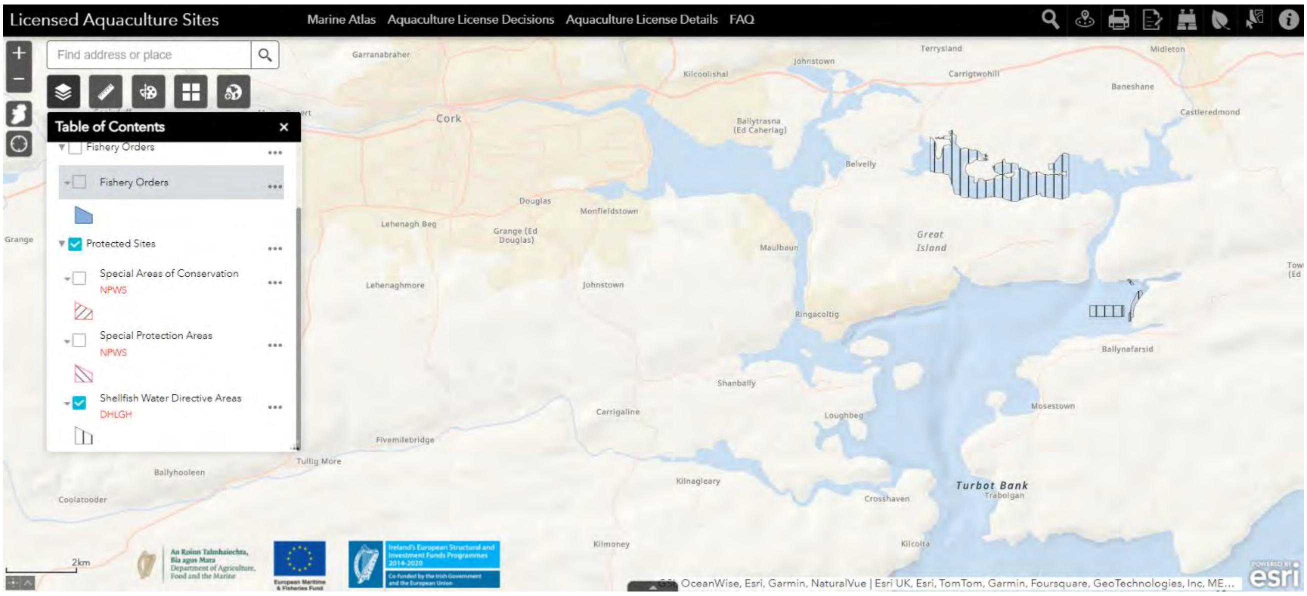


Figure 2-10: Protected sites, Shellfish Waters Directive areas (DHLG)

Table 2-9: Protected sites – Shellfish Water Directive Areas (DHLG) (source: https://dafm-maps.marine.ie/aquaculture-viewer/).

Protected sites	Shellfish Water Directive Areas (DHLG)	Site Reference
	Cork Great Island North Channel	T05-294A
	Rostellan West	T05-522B
	Rostellan South	T05_522B
	Rostellan North	T05-522B

EU countries are responsible for designating shellfish waters. The list of designated waters may be amended to take into consideration factors not foreseen at the time of designation.

If waters immediately adjacent to borders with neighbouring EU countries are designated as shellfish waters, these countries must be consulted.

Quality criteria

The directive establishes parameters applicable to designated shellfish waters, indicative values, mandatory values, reference methods of analysis and the minimum frequency for taking samples and measures.

The parameters applicable to shellfish waters are set for:

pH,

temperature,

coloration,

suspended solids,

salinity,

dissolved oxygen and

the presence or concentration of certain substances (hydrocarbons, metals, organohalogenated substances).

Based on these criteria, EU countries establish the values with which the designated shellfish waters must comply. These limit values may be stricter than those set by this directive. For metals or organohalogenated substances, these values must respect the emission rules originally established in line with Directive 2006/11/EC on the discharge of certain substances into the aquatic environment (and, since 2013, incorporated in Directive 2000/60/EC, the EU's Framework Water Directive).

Samples

The competent authorities for each EU country must take samples from the waters to verify their conformity with the criteria set by the directive. The following proportions of samples must conform to the established values:

100 % of the samples for the parameters ‘organohalogenated substances’ and ‘metals’;

95 % of the samples for the parameters ‘salinity’ and ‘dissolved oxygen’;

75 % of the samples for the other parameters.

ACT and related act

Directive 2006/113/EC of the European Parliament and of the Council of 12 December 2006 on the quality required of shellfish waters (codified version) (OJ L 376, 27.12.2006, pp. 14–20)

Successive amendments to Directive 2006/113/EC have been incorporated into the original text. This consolidated version is of documentary value only.

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, pp. 1–73). See consolidated version.

Quality of shellfish waters | EUR-Lex (europa.eu)

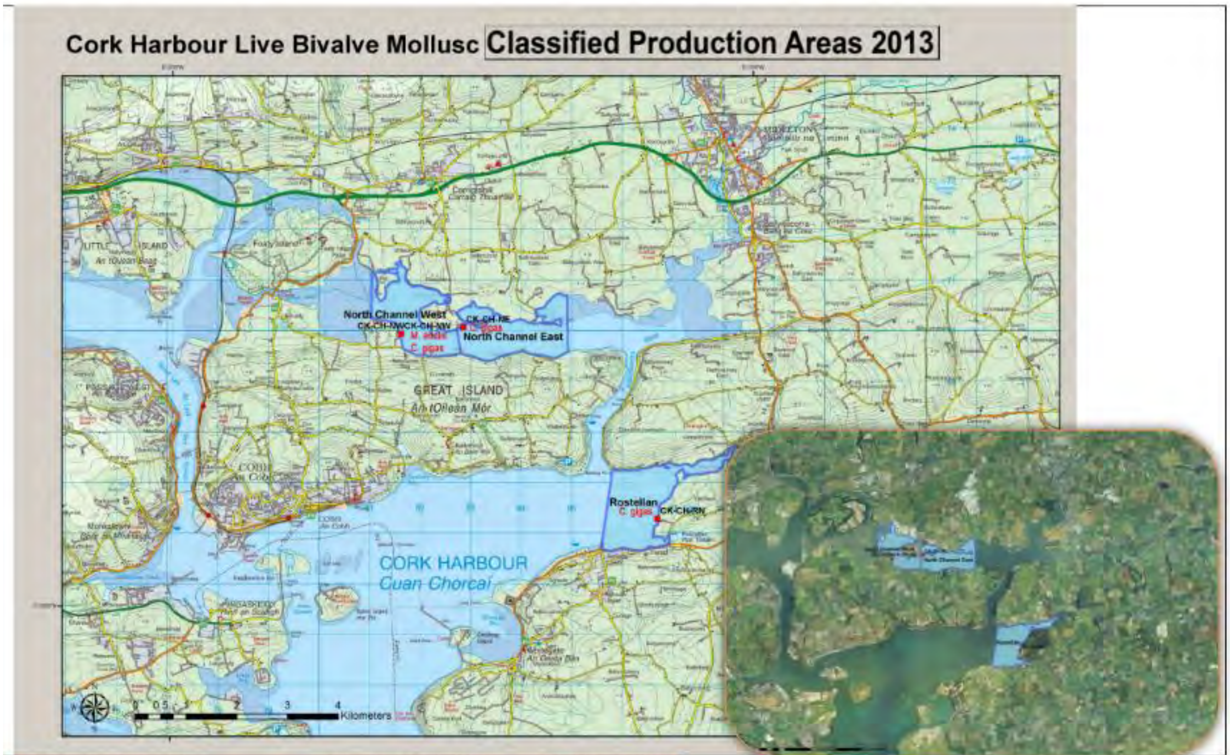
The SFPA is responsible for regulating the seafood sector, including aquaculture, ensuring compliance with food safety laws. Bivalve molluscs feed by filtering water, which can lead to the accumulation of harmful microorganisms or biotoxins in their flesh. These can pose a risk if consumed, particularly oysters, which are often eaten raw.

In addition, the SFPA conducts a monthly shellfish sampling programme across all active production areas. These results determine the classification of each area for the sale or consumption of shellfish, which falls into three categories (Table 2-10) based on *E. coli* levels.

Table 2-10: Shellfish Classification based on *E. coli* monitoring

Category	Microbiological Standard (MPN 100g-1 shellfish flesh)	Treatment Required
Class A	<230 *E. coli*	May be consumed directly
Class B	<4,600 *E. coli* (90% compliance)	Must be depurated, heat treated, or relayed to meet Class A standards
Class C	<46,000 *E. coli*	Must be relayed for 2 months or heat treated to meet Class A or B standards

There are three classified shellfish waters at North Channel East (native and gigas oysters) and Rostellan (Gigas oysters) (Figure 2-11). All three shellfish waters in Cork Harbour have a B classification (Table 2-11).



ProductionSite	ProductionArea	AreaCode	SamplePoint	Species	XLocation	YLocation
Cork Harbour	North Channel West	CK-CH-NW		M. edulis	-8.2675	51.8819
Cork Harbour	North Channel West	CK-CH-NW		C. Gigas	-8.2675	51.8819
Cork Harbour	North Channel East	CK-CH-NE		C. Gigas	-8.2497	51.8831
Cork Harbour	Rostellan	CK-CH-RN		C. Gigas	-8.1939	51.8492

Figure 2-11: Cork Harbour Live Bivalve Mollusc (Classified Production Areas 2013 - (https://www.sfpa.ie/LinkClick.aspx?fileticket=nyFQqrK86Gk%3d&portalid=0&resourceView=1).

Table 2-11: Cork Harbour Classified Production areas (https://www.sfpa.ie/What-We-Do/Molluscan-Shellfish/Classified-Areas).

Production Area and Link to Map	Boundaries	Bed Name	Species	Class	Notes
Harbour Classified Production Areas	Between 8° 16.4'W and 8° 15.6'W. Between 8° 14.6'W and 8° 13.2'W. Ahada Pier to Gold Point	North Channel East	Native Oysters	B	
		North Channel East	Oysters (Gigas)	B	
		Rostellan	Oysters (Gigas)	B	

2.9. Summary and considerations

This desk study focused on fisheries, aquaculture, and the presence of commercial fish and shellfish species. Sources such as Ireland's Marine Atlas, the National Biodiversity Data Centre, and various reports were used to identify species of ecological and commercial significance, with additional focus on aquaculture activities in Cork Harbour. Commercial fish species such as cod, herring, horse mackerel, and whiting are identified as present in local nursery and spawning grounds, while shellfish species such as blue mussels and oysters are important from an aquaculture perspective. This study investigated local fishing activities, including pot fishing for brown crab, lobster, and shrimp, as well as recreational fishing in the area. Licensed aquaculture sites within Cork Harbour were highlighted, along with fishery orders in place for blue mussels and flat oyster production.

An assessment of dredging and physical construction impacts

Dredging involves removing the surface sediment layers, disrupting the seabed and its associated fauna and infauna. This process also affects mobile species closely associated with the seabed, such as shrimp (*Crangon* species) and harbour/ green crabs, which may be caught in the dredging operation. Also, as the sediment is disturbed, it becomes suspended in the water column, causing a temporary increase in turbidity, the concentration of suspended solids in the water column. This plume of sediment will disperse over time and be diluted by tidal mixing, thereby reducing the impact away from the immediate dredging area.

Entrainment, where fish and invertebrates are sucked up along with the sediment, is another impact for consideration. Suction Dredgers, which use pumps to collect sediment, will inadvertently entrain fish that live near the bottom, such as juvenile flatfish such as flounder, plaice, dab, and sole, which are found around Ringaskiddy. Other species that may be affected include sand gobies, black gobies, dragonets, and pogge. Gadoid fish such as whiting and cod are less affected, as they are not as closely associated with the seabed, while pelagic species like sprat and mackerel, which swim higher in the water column, are at lower risk of being caught up.

Despite the potential for entrainment, the overall impact on fish populations is expected to be minor to moderate. This is because the species involved appear to be abundant and widespread, and much of the intertidal areas of Ringaskiddy will not be affected by the dredging. Also, many of these smaller species have short life cycles and high reproductive rates, allowing for rapid recovery.

The risk to salmon if present, is very low due to their rapid movement, low numbers and the intermittent nature of dredging.

Suspended solids concentrations may reach high levels near a dredging location, particularly around the Ringaskiddy basin, but these concentrations decline with distance due to tidal mixing. The levels expected are not high enough to cause significant harm to fish, especially since many species are adapted to turbid environments and will probably move away from areas where there is significant activity. For example, bottom-dwelling species such as flatfish and gobies are naturally tolerant of high suspended solids levels, as they often live in areas with fine silts and muds. Migratory species like salmon, which are very unlikely to be in the area, if they were to encounter high levels would pass through such an area quickly.

While the dredging may result in some entrainment of species such as juvenile flatfish, gobies, crabs, and other species, the overall impact is expected to be moderate and have short term consequences. The risk to more valuable species, like salmon, is considered minimal due to their migration routes and the location of dredging activity. The temporary increase in suspended solids is not expected to have a significant adverse effect on fish populations, and the localised nature of the activities means they are unlikely to affect the broader ecosystem of the Ringaskiddy.

Potential Impacts of Noise on Fish and Mitigation Measures

The construction phase of a marine development, such as pile driving and dredging present potential noise impacts on fish populations. As fish have a reliance on sound for communication, predator detection, and navigation, notably in murky waters where visibility is low, noise pollution in marine environments can disrupt these behaviours and adversely affect fish.

Most fish are reported to hear within the range of 30-1000 Hz. Species such as the European eel can detect infrasound, while herrings can perceive ultrasound, which helps them avoid predators like dolphins (Bates, 2012). The sounds produced by construction activities, such as pile driving, can therefore interfere with fish behaviour and cause disorientation. Furthermore, it has been found that exposure to high-intensity sounds have been shown to cause physical harm to fish, including hearing loss, stress responses, and in extreme cases, death (Popper *et al*., 2010; Weilgart, 2018). The mechanical sounds from dredgers can increase stress levels in fish and disrupt their spawning behaviour (Weilgart, 2018). The sound disturbance may also alter fish distribution patterns, forcing species away from important feeding or breeding grounds.

Mitigation measures are crucial to minimise the impact of noise on fish during both the construction and operational phases. These can include:

- Limiting construction activities to periods when sensitive species, such as migratory fish, are less likely to be present in the area can reduce the risk of noise-related impacts. Though this is not an issue with Ringaskiddy as there are no migratory routes identified.
- Gradually increasing the intensity of noise-generating activities allows fish to vacate an area, reducing the potential of sudden exposure to harmful noise levels.

The proposed redevelopment of Ringaskiddy port may affect local fish populations in the short-term during construction and any subsequent maintenance dredging. However, the fish species identified are expected to move away from the site and migrate back as these activities cease. There are also nursery and spawning grounds for commercial fish species within Cork Harbour, they too will tend to avoid areas of disturbance such as Ringaskiddy and return once the activity has concluded. Regarding aquaculture activities in the harbour, these are situated at a significant distance from the site and will not be impacted.

Table 2-12: SACs designated for Annex II migratory fish species.

SAC [site code]	Conservation Features (Conservation Features Code)			
	Twaite shad (*Alosa fallax fallax*) (1103)	River lamprey (*Lampetra fluviatilis*) (1099)	Sea lamprey (*Petromyzon marinus*) (1095)	Atlantic salmon (*Salmo salar*) (1106)
Blackwater River (Cork/Waterford) SAC [002170]	●	●	●	●
Blackwater River (Kerry) SAC [002173]				●
Castlemaine Harbour SAC [000343]		●	●	●
Cloghernagore Bog and Glenveagh National Park SAC [002047]				●
Connemara Bog Complex SAC [002034]				●
Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC [000627]		●	●	
Glenamoy Bog Complex SAC [000500]				●
Killala Bay/Moy Estuary SAC [000458]			●	
Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC [000365]		●	●	●
Leannan River SAC [002176]				●
Lough Corrib SAC [000297]			●	●
Lough Eske and Ardnamona Wood SAC [000163]				●
Lough Gill SAC [001976]		●	●	●
Lough Melvin SAC [000428]				●
Lower River Shannon SAC [002165]		●	●	●
Lower River Suir SAC [002137]	●	●	●	●

SAC [site code]	Conservation Features (Conservation Features Code)			
	Twaite shad (*Alosa fallax fallax*) (1103)	**River lamprey (*Lampetra fluviatilis*) (1099)**	**Sea lamprey (*Petromyzon marinus*) (1095)**	**Atlantic salmon (*Salmo salar*) (1106)**
Maumturk Mountains SAC [002008]				●
Mweelrea/Sheeffry/Erriff Complex SAC [001932]				●
Newport River SAC [002144]				●
Owenduff/Nephin Complex SAC [000534]				●
River Barrow and River Nore SAC [002162]	●	●	●	●
River Boyne and River Blackwater SAC [002299]				●
River Finn SAC [002301]				●
River Moy SAC [002298]			●	●
Slaney River Valley SAC [000781]	●	●	●	●
The Twelve Bens/Garraun Complex SAC [002031]				●
Unshin River SAC [001898]				●
West of Ardara/Maas Road SAC [000197]				●

Table 2-13: Observations of fish and shellfish from the national biodiversity data base at sites W76X and W76.

Species group	Species name	Record count	Date of last record	Title of dataset	Designation	Site
crustacean	*Cancer pagurus*	1	16/01/2020	Explore Your Shore		W76X
crustacean	*Elminius modestus*	1	08/02/2024	Explore Your Shore	Invasive Species: Invasive Species | | Invasive Species: Invasive Species >> Medium Impact Invasive Species	W76X
mollusc	*Buccinum undatum*	2	08/02/2024	Explore Your Shore		W76X
mollusc	Chequered Carpet Shell (*Tapes decussatus*)	1	08/02/2024	Explore Your Shore		W76X
mollusc	Common Cockle (*Cerastoderma edule*)	2	08/02/2024	Explore Your Shore		W76X
mollusc	Common Limpet (*Patella vulgata*)	1	08/02/2024	Explore Your Shore		W76X
mollusc	Common Oyster (*Ostrea edulis*)	1	06/03/2020	Explore Your Shore	Threatened Species: OSPAR Convention	W76X
mollusc	Common Periwinkle (*Littorina littorea*)	1	08/02/2024	Explore Your Shore		W76X

Species group	Species name	Record count	Date of last record	Title of dataset	Designation	Site
mollusc	Dog Whelk (*Nucella lapillus*)	1	14/01/2020	Explore Your Shore	Threatened Species: OSPAR Convention	W76X
mollusc	Flat Top Shell (*Gibbula umbilicalis*)	1	08/02/2024	Explore Your Shore		W76X
mollusc	Great Scallop (*Pecten maximus*)	2	27/02/2024	Explore Your Shore		W76X
mollusc	Grey Top Shell (*Gibbula cineraria*)	2	13/08/2023	Explore Your Shore		W76X
mollusc	Horse-mussel (*Modiolus modiolus*)	1	08/02/2024	Explore Your Shore		W76X
mollusc	*Mytilus edulis*	1	17/12/2019	Explore Your Shore		W76X
mollusc	Netted Dog Whelk (*Hinia reticulata*)	1	16/01/2020	Explore Your Shore		W76X
mollusc	*Peringia ulvae*	1	17/08/1997	All Ireland Non-Marine Molluscan Database		W76X
mollusc	Pod Razor Shell (*Ensis siliqua*)	2	13/08/2023	Explore Your Shore		W76X
mollusc	Prickly Cockle (*Acanthocardia echinata*)	1	04/02/2021	Explore Your Shore		W76X

Species group	Species name	Record count	Date of last record	Title of dataset	Designation	Site
mollusc	Pullet Carpet Shell (*Venerupis senegalensis*)	2	08/01/2020	Explore Your Shore		W76X
bony fish (Actinopterygii)	Atlantic Bonito (*Sarda sarda*)	1	22/07/1913	Rare marine fishes taken in Irish waters from 1786 to 2008		W76
bony fish (Actinopterygii)	Black Goby (*Gobius niger*)	1	23/10/2022	Explore Your Shore		W76
bony fish (Actinopterygii)	Bull Rout (*Myoxocephalus scorpius*)	1	21/05/2020	Explore Your Shore		W76
bony fish (Actinopterygii)	Butterfish (*Pholis gunnellus*)	1	21/05/2020	Explore Your Shore		W76
bony fish (Actinopterygii)	Common Goby (*Pomatoschistus microps*)	2	26/07/2006	Irish Lagoon Surveys		W76
bony fish (Actinopterygii)	European Eel (*Anguilla anguilla*)	3	08/10/2008	River Biologists' Database (EPA)	Threatened Species: Critically Endangered	W76
bony fish (Actinopterygii)	Flounder (*Platichthys flesus*)	1	01/06/2006	Irish Lagoon Surveys		W76

Species group	Species name	Record count	Date of last record	Title of dataset	Designation	Site
bony fish (Actinopterygii)	Horse Mackerel (*Trachurus trachurus*)	1	10/09/2022	Explore Your Shore		W76
bony fish (Actinopterygii)	Mugilidae	1	11/07/2021	iNaturalist Marine Species Records for Ireland		W76
bony fish (Actinopterygii)	Sand Goby (*Pomatoschistus minutus*)	1	01/06/2006	Irish Lagoon Surveys		W76
bony fish (Actinopterygii)	Sand Smelt (*Atherina presbyter*)	1	01/06/2006	Irish Lagoon Surveys		W76
bony fish (Actinopterygii)	Shadefish (*Argyrosomus regius*)	1	01/08/1840	Rare marine fishes taken in Irish waters from 1786 to 2008		W76
bony fish (Actinopterygii)	Shanny (*Lipophrys pholis*)	1	21/05/2020	Explore Your Shore		W76
bony fish (Actinopterygii)	Sprat (*Sprattus sprattus*)	1	18/08/2020	Explore Your Shore		W76

Species group	Species name	Record count	Date of last record	Title of dataset	Designation	Site
bony fish (Actinopterygii)	Stone Loach (*Barbatula barbatula*)	1	10/08/2005	River Biologists' Database (EPA)		W76
bony fish (Actinopterygii)	Thick-lipped Mullet (*Chelon labrosus*)	1	24/07/2021	iNaturalist Marine Species Records for Ireland		W76
bony fish (Actinopterygii)	Three-spined Stickleback (*Gasterosteus aculeatus*)	1	01/06/2006	Irish Lagoon Surveys		W76
bony fish (Actinopterygii)	Tompot Blenny (*Parablennius gattorugine*)	1	23/10/2022	Explore Your Shore		W76
cartilagenous fish (Chondrichthyes)	Lesser Spotted Dogfish (*Scyliorhinus canicula*)	1	22/07/2019	Explore Your Shore		W76
cartilagenous fish (Chondrichthyes)	Thornback Ray (*Raja clavata*)	1	31/08/1977	Rare marine fishes taken in Irish waters from 1786 to 2008	Threatened Species: OSPAR Convention	W76

Species group	Species name	Record count	Date of last record	Title of dataset	Designation	Site
crustacean	*Allomelita pellucida*	1	01/06/2006	Irish Lagoon Surveys		W76
crustacean	*Balanus improvisus*	1	26/07/2006	Irish Lagoon Surveys	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)	W76
crustacean	Brown Shrimp (*Crangon crangon*)	2	26/07/2006	Irish Lagoon Surveys		W76
crustacean	*Cancer pagurus*	1	16/01/2020	Explore Your Shore		W76
crustacean	Chameleon Shrimp (*Praunus flexuosus*)	1	26/07/2006	Irish Lagoon Surveys		W76
crustacean	Common Prawn (*Palaemon serratus*)	1	26/07/2006	Irish Lagoon Surveys		W76
crustacean	Common Sea Slater (*Ligia oceanica*)	2	05/06/2022	Explore Your Shore		W76
crustacean	*Corophium insidiosum*	1	26/07/2006	Irish Lagoon Surveys		W76
crustacean	*Corophium volutator*	2	26/07/2006	Irish Lagoon Surveys		W76

Species group	Species name	Record count	Date of last record	Title of dataset	Designation	Site
crustacean	*Elminius modestus*	2	08/02/2024	Explore Your Shore	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species	W76
crustacean	*Gammarus chevreuxi*	1	26/07/2006	Irish Lagoon Surveys		W76
crustacean	*Gammarus oceanicus*	1	21/05/2020	Explore Your Shore		W76
crustacean	*Gammarus zaddachi*	1	01/06/2006	Irish Lagoon Surveys		W76
crustacean	Green Shore Crab (*Carcinus maenas*)	6	05/06/2022	Explore Your Shore		W76
crustacean	*Jaera forsmani*	1	26/07/2006	Irish Lagoon Surveys		W76
crustacean	*Lekanesphaera hookeri*	1	01/06/2006	Irish Lagoon Surveys		W76
crustacean	*Lekanesphaera rugicauda*	1	26/07/2006	Irish Lagoon Surveys		W76
crustacean	*Leptocheirus pilosus*	1	26/07/2006	Irish Lagoon Surveys		W76
crustacean	*Melita palmata*	1	26/07/2006	Irish Lagoon Surveys		W76

Species group	Species name	Record count	Date of last record	Title of dataset	Designation	Site
crustacean	*Microdeutopus gryllotalpa*	1	26/07/2006	Irish Lagoon Surveys		W76
crustacean	*Neomysis integer*	2	26/07/2006	Irish Lagoon Surveys		W76
crustacean	*Palaemon elegans*	1	26/07/2006	Irish Lagoon Surveys		W76
crustacean	*Palaemon elegans/serratus*	1	21/05/2020	Explore Your Shore		W76
crustacean	*Palaemonetes varians*	2	26/07/2006	Irish Lagoon Surveys		W76
mollusc	*Buccinum undatum*	3	08/02/2024	Explore Your Shore		W76
mollusc	Chequered Carpet Shell (*Tapes decussatus*)	1	08/02/2024	Explore Your Shore		W76
mollusc	Common Cockle (*Cerastoderma edule*)	3	08/02/2024	Explore Your Shore		W76
mollusc	Common Limpet (*Patella vulgata*)	3	08/02/2024	Explore Your Shore		W76

Species group	Species name	Record count	Date of last record	Title of dataset	Designation	Site
mollusc	Common Otter Shell (*Lutraria lutraria*)	1	21/05/2020	Explore Your Shore		W76
mollusc	Common Oyster (*Ostrea edulis*)	2	21/05/2020	Explore Your Shore	Threatened Species: OSPAR Convention	W76
mollusc	Common Periwinkle (*Littorina littorea*)	5	08/02/2024	Explore Your Shore		W76
mollusc	Dog Whelk (*Nucella lapillus*)	1	14/01/2020	Explore Your Shore	Threatened Species: OSPAR Convention	W76
mollusc	Flat Top Shell (*Gibbula umbilicalis*)	1	08/02/2024	Explore Your Shore		W76
mollusc	Great Scallop (*Pecten maximus*)	2	27/02/2024	Explore Your Shore		W76
mollusc	Grey Top Shell (*Gibbula cineraria*)	2	13/08/2023	Explore Your Shore		W76
mollusc	Horse-mussel (*Modiolus modiolus*)	1	08/02/2024	Explore Your Shore		W76
mollusc	Lagoon Cockle (*Cerastoderma glaucum*)	1	26/07/2006	Irish Lagoon Surveys		W76

Species group	Species name	Record count	Date of last record	Title of dataset	Designation	Site
mollusc	Laver Spire Shell (*Hydrobia ulvae*)	2	26/07/2006	Irish Lagoon Surveys		W76
mollusc	*Littorina obtusata/mariae*	1	21/05/2020	Explore Your Shore		W76
mollusc	*Mytilus edulis*	5	24/05/2020	Explore Your Shore		W76
mollusc	Netted Dog Whelk (*Hinia reticulata*)	1	16/01/2020	Explore Your Shore		W76
mollusc	Pod Razor Shell (*Ensis siliqua*)	3	13/08/2023	Explore Your Shore		W76
mollusc	Prickly Cockle (*Acanthocardia echinata*)	1	04/02/2021	Explore Your Shore		W76
mollusc	Pullet Carpet Shell (*Venerupis senegalensis*)	2	08/01/2020	Explore Your Shore		W76
mollusc	Rough Periwinkle (*Littorina saxatilis*)	1	26/07/2006	Irish Lagoon Surveys		W76

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[1] https://atlas.marine.ie

[2] https://dafm-maps.marine.ie/aquaculture-viewer/

[3] National Biodiversity Data Centre – A Heritage Council Programme, Documenting Ireland's Wildlife

[4] http://maps.biodiversityireland.ie

[5] http://www.npws.ie/mapsanddata/

Appendix D – Annex IV Species Risk Assessment

Maritime Usage Licence Application for Marine Site Investigation Surveys at Port of Cork, Ringaskiddy, County Cork

Document Control

Project

Client

Document

Report Number:

Document Checking:

Date	Rev	Details of Issue	Prepared by	Checked by	Approved by

Disclaimer: Please note that this report is based on specific information, instructions, and information from our Client and should not be relied upon by third parties.

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Contents

[1] Introduction

[1.1] Preamble

[1.2] Project Overview

[1.3] Project Setting

[1.4] Preparation of Report

Table 1-1. Ayesa Team

Title	Name	Role	Qualifications	Years' experience

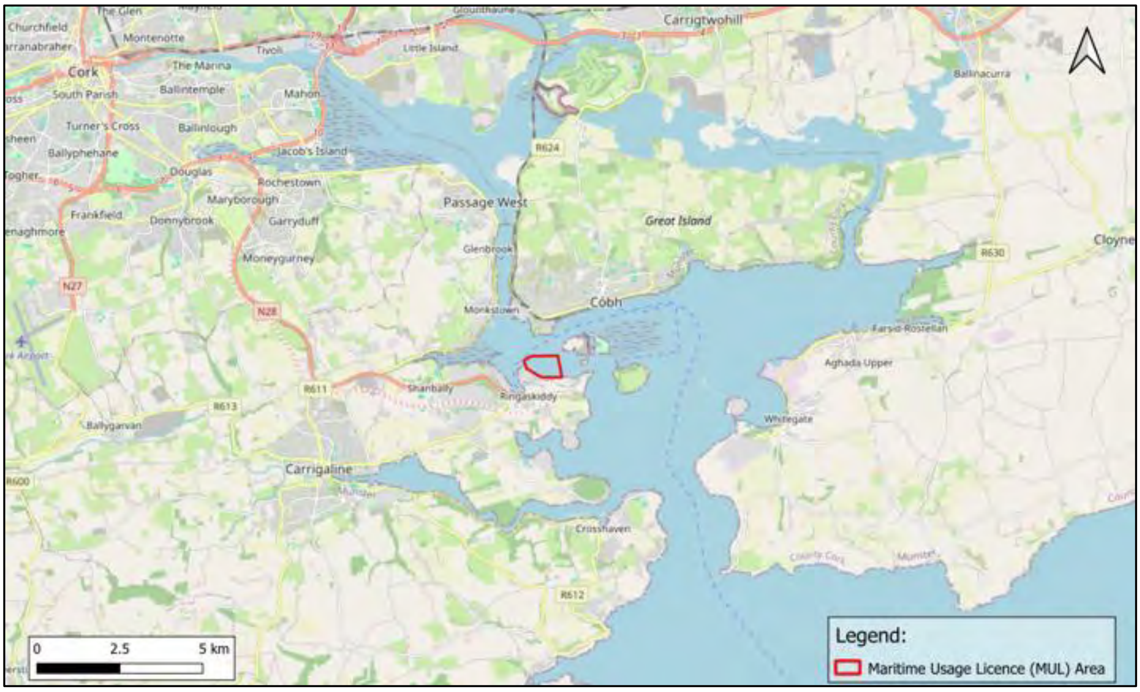

Figure 1-1. Map of Site Location.

Figure 1-2. Approximate location of the proposed MUL area

[1.5] Purpose of Report

Phocoena phocoena
Delphinus delphis *Balaenoptera acutorostrata* *Halichoerus grypus*
Phoca vitulina *Lutra lutra*

[1.6] Legislative Context

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Table 1-2

Table 1-2. Summary of Legislation, Conventions, and Guidance Relevant to Annex IV Species Protection

Legislation / Convention	Annex IV Species Receptor(s)

et al.

[2] Relevant Annex IV Species

Tursiops truncatus

Balaenoptera acutorostrata *Grampus griseus*
Lagenorhynchus albirostris

Tursiops truncatus

et al.

et al. *et al.*

et al.

Dephinus delphis

et al.

et al.

Grampus griseus

et al.

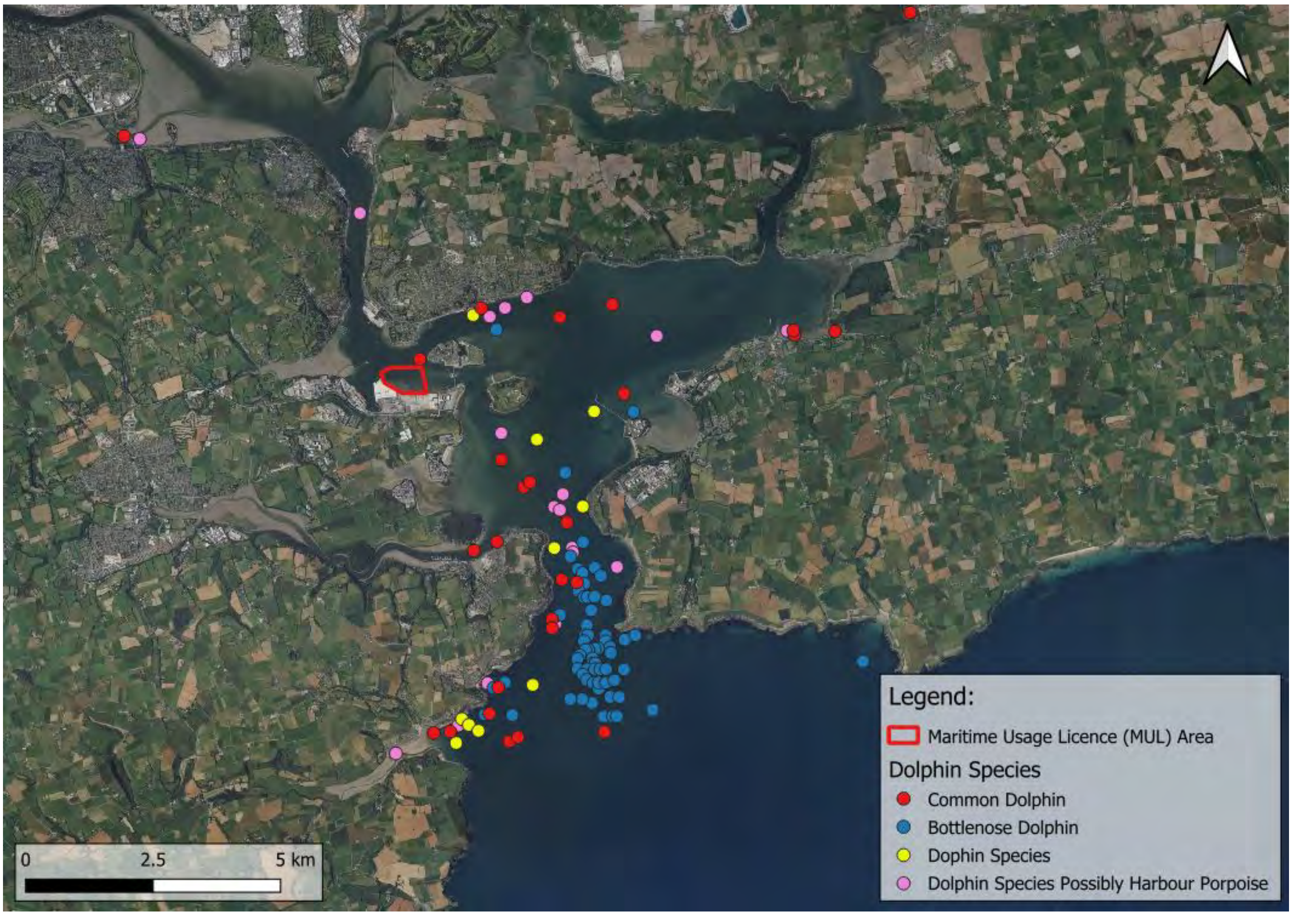

Figure 2-1. Dolphin sightings recorded in the Cork Harbour Area (IWDG, NBDC maps)

Phocoena Phocoena

et al.

Figure 2-2. Harbour porpoise sightings recorded in the Cork Harbour Area (IWDG, NBDC maps)

Balaenoptera acutorostrata

Balaenoptera physalus

Megaptera novaeangliae

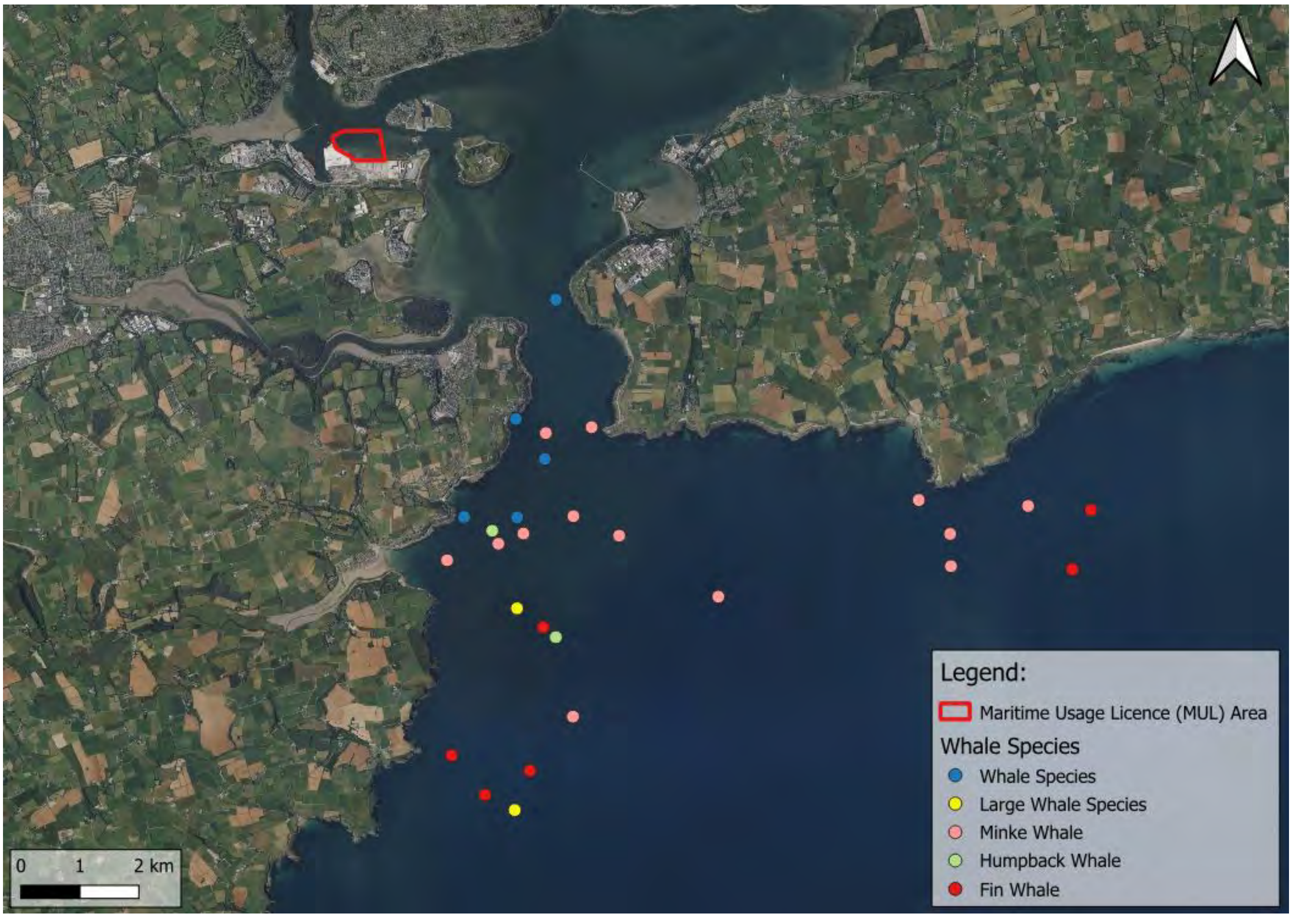

Figure 2-3. Whale species recordings in the Cork Harbour Area (IWDG, NBDC maps)

Dermochelys coriacea

Figure 2-4. Leatherback turtle sightings recorded in the Cork Harbour area (IWDG, NBDC maps)

Lutra lutra

Lutra lutra

Figure 2-5. Otter point distribution in the Cork Harbour area (Article 17, NBDC)

Pipistrellus pipistrellus sensu lato

Table 2-1. Landscape suitability indices for bats in Grid W76

Scientific Name	Common Name	Suitability Index
Pipistrellus pygmaeus		
Plecotus auritus		
Pipistrellus pipistrellus		
Rhinolophus hipposideros		
Nyctalus leisleri		
Myotis mystacinus		
Myotis daubentonii		
Pipistrellus nathusii		
Myotis nattereri		

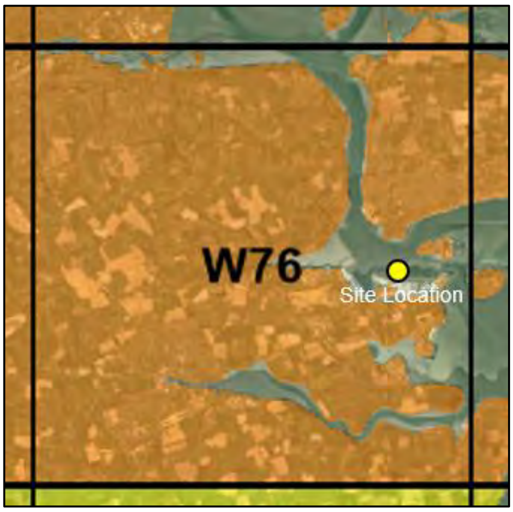

Figure 2-6. Grid W76 showing site location (NBDC)

Figure 2-7. Basking shark sightings in the Cork Harbour area (IWDG, NBDC maps)

Halichoerus grypus

Phoca vitulina

[3] Outline of Scope of Works

[3.1] Description of Proposed Works

Crangon crangon *Carcinus maenas*

Carcinus maenas

Crangon crangon

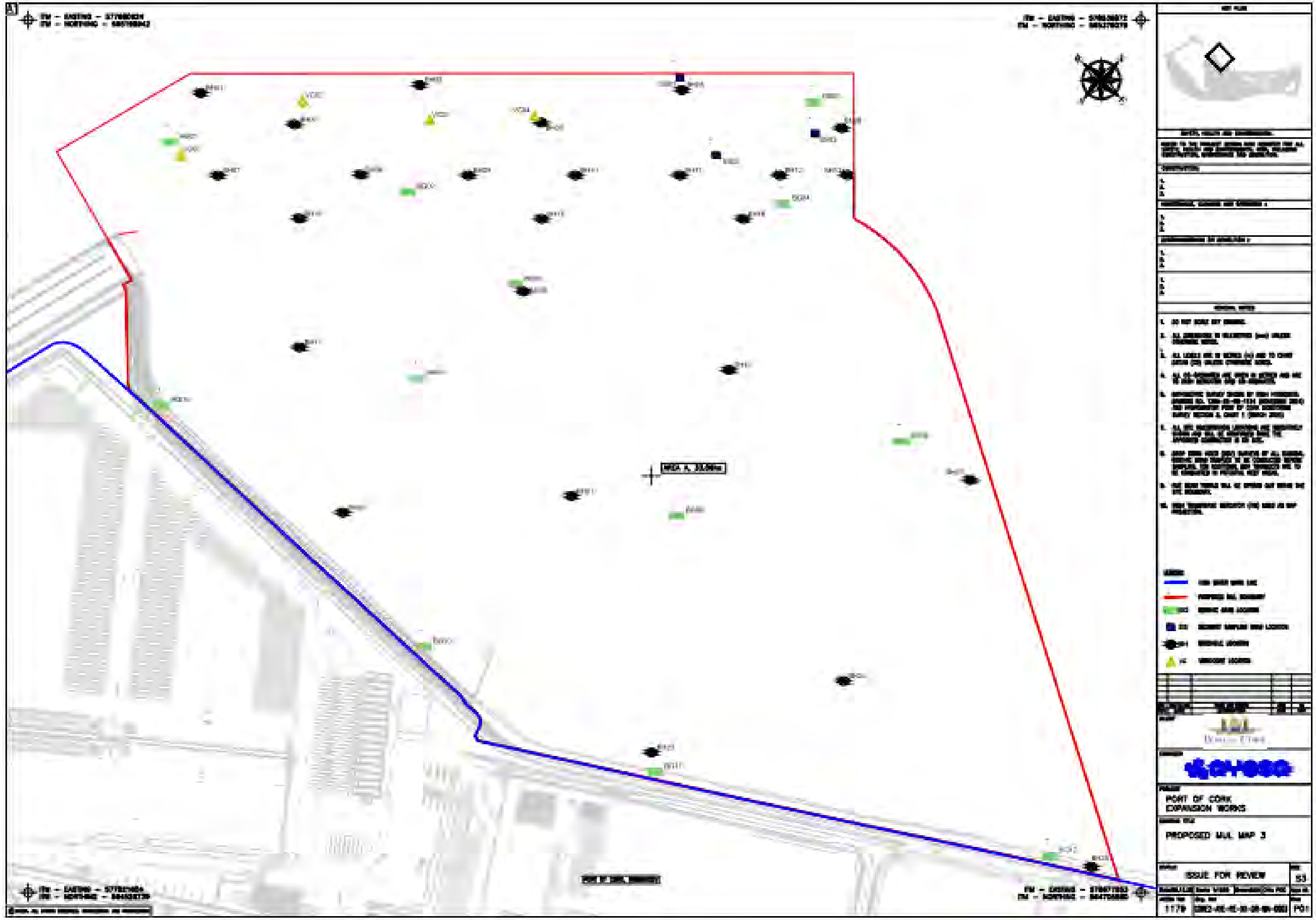

Figure 3-1. Map of survey requirements

[4] Source of Impacts

[4.1] Underwater Noise and Vibration

[4.2] Siltation and Turbidity

[4.3] Hydrocarbon or Contaminant Spills

Minor spills

Machinery leaks

Surface residues

Surface Vessels

Suspension of fine sediments

Weathering and dispersion processes

Trophic transfer

[5] Impact Assessment

[5.1] Siltation and Turbidity

low to negligible.

[5.2] Hydrocarbon or Contaminant Spills

low to negligible.

[5.3] Noise and Vibration Disturbance

low to negligible.

[5.4] Vessel Collision Risk

low to negligible.

[5.5] Summary of Potential Impacts

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Table 5-1: Summary of Potential Impacts to Annex IV species and seals

Impact Source	Summary of Potential Effect and Overall Risk Rating
	Risk: Low to Negligible.
	Risk: Low to Negligible.

Risk: Low to Negligible.

Risk: Negligible.

negligible

low to negligible

Lutra lutra

Lutra lutra

Lutra lutra **low to negligible**

low to negligible

Cetorhinus maximus

low to negligible.

[6] Conclusion

negligible

[7] References

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