Bowdun Offshore Wind Farm, Offshore EIA Report

Volume 3, Technical Appendix 8.1: Benthic Ecology Technical Report

TWP-BOW-RPS-OFE-RPT-00012 | April 2026

Contents

List of Tables

List of Figures

Glossary

Defined Term	Definition
Annex I	Habitats of community interest whose conservation requires the designation of Special Areas of Conservation (SACs), as identified in Annex I of the Habitats Directive (Council Directive 92/43/EEC).
Array Area	The Array Area is the area in which the Offshore Generation Assets will be located.
Benthic	Living on or in the seabed.
Biomass	Total weight of organisms.
Biotope	A term which refers to the combination of physical environment (habitat) and its distinctive assemblage of conspicuous species. The biotope concept is used to enable description and comparison. Within biotope names, Latin names of species are used in full on every mention (e.g. Genus species) and never abbreviated or referred to using a common name.
Blue Carbon	Carbon captured by the world's ocean and coastal ecosystems. Typically includes carbon stored within ocean sediments and ocean vegetation such as seagrasses or kelp.
Bowdun Offshore Wind Farm Limited (BOWFL)	A Special Purpose Vehicle (SPV) (legal entity) for the purpose of developing the Project. BOWFL are the Applicant for the Offshore Application.
Circalittoral	The subzone of the rocky sublittoral below that dominated by algae (the infralittoral) and dominated by animals.
E3 Plan Option Area (POA)	One of 15 sustainable POAs for development of commercial scale offshore wind energy in Scotland, defined within the Scottish Sectoral Marine Plan for Offshore Wind Energy.
Effect	Term used to express the consequence of an impact (i.e. the result of change or changes on specific environmental resources or receptors). The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity of the receptor or resource in accordance with defined significance criteria.
Environmental Impact Assessment (EIA)	Process for the assessment of likely significant environmental effects of a project on the physical, biological and human environment during construction, Operation and Maintenance (O&M) and decommissioning.
European Sites	This term recognises Special Area of Conservation (SACs), candidate SACs (cSACs), Sites of Community Importance (SCIs), Special Protection Areas (SPAs), possible SACs (pSACs), potential SPAs (pSPAs) and Ramsar sites (where also designated as another European Site), which protect species and habitats shared across Europe and were originally designated under European legislation.
Export Cable Corridor	The area seaward of Mean High Water Springs (MHWS) which connects the Array Area with the Landfall within which the Offshore Export Cables will be installed.
Impact	A change caused by an action that occurs during a project's lifetime.

Defined Term	Definition
Important Ecological Feature (IEF)	Habitats, species and ecosystems (including ecosystem function and processes) that may be affected by the Proposed Development, with reference to a geographical context in which they are considered important.
Infauna	Organisms living within the seabed sediment.
Infralittoral	A subzone of the sublittoral in which upward-facing rocks are dominated by erect algae, typically kelps; it can be further subdivided into the upper and lower infralittoral.
Inter-Array Cables (IAC)	Cables which link the Wind Turbines to each other and with the Offshore Substation Platforms (OSPs).
Intertidal Area	The area between MHWS and Mean Low Water Springs (MLWS).
Landfall	The area in which the Offshore Export Cables make landfall and is also the transitional area between the Offshore Transmission Assets and the Onshore Transmission Assets. Located in the Intertidal Area at Benholm.
Macrobenthos	Benthic organisms that are greater than or equal to 0.5 mm in size.
Marine Protected Areas (MPAs)	MPAs are designated under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act (MCAA) 2009. The MPA network protects nationally and internationally important marine wildlife, habitats, geology, and underwater landforms. Scotland's MPAs are significantly important for European, North-East Atlantic, and global MPA networks.
Mean High Water Springs (MHWS)	The average tidal height throughout the year of two successive high waters during those periods of 24 hours when the range of the tide is at its greatest.
Mean Low Water Springs (MLWS)	The average tidal height throughout the year of two successive low waters during those periods of 24 hours when the range of the tide is at its greatest.
Offshore Export Cables	Subsea cables used to transmit electricity generated offshore by the Wind Turbines from the OSPs to shore. The Transition Joint Bay (TJB) is the location where the Offshore Export Cables terminate, and the onshore cabling begins.
Offshore Generation Assets	The infrastructure of the Proposed Development required to generate electricity comprising of the Wind Turbines, Wind Turbine foundations and associated infrastructure (e.g. IACs).
Oslo-Paris [Convention] (OSPAR)	Convention for the Protection of the Marine Environment of the North-East Atlantic.
Project (the)	An overarching term for the Bowdun Offshore Wind Farm (Bowdun OWF) comprising the offshore and onshore infrastructure required to generate and transmit electricity from the Array Area to the onshore Grid Connection Point (GCP). The Project includes the Offshore Generation Assets, the Offshore Transmission Assets and the Onshore Transmission Assets.
Proposed Development	Term used to define the Offshore Infrastructure associated with the Project seaward of MHWS for which consent is being sought. Further details of the parameters are included in Volume 1, Chapter 3: Project Description.

Defined Term	Definition
Scoping Opinion	A document produced by MD-LOT which is issued in response to submission and review of the Offshore Scoping Report. The Scoping Opinion is supported with feedback and advice from consultees, which details what is expected to be included in the Offshore EIA Report and what can be scoped out of the EIA process.
Sectoral Marine Plan (SMP)	A plan developed by the Scottish Government which provide the strategically planned spatial footprint for offshore wind development in Scotland.
Significance	Effect factor that is determined by the magnitude of impact along with the sensitivity of the receptor.
Special Areas of Conservation (SACs)	SACs are areas designated for the conservation of certain plant and animal species listed in the Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.
Subtidal	Areas of the coastal marine environment that lie below the level of MLWS and are continuously submerged by seawater.
Thistle Wind Partners (TWP)	Company established for the development of the Project.
Wind Turbines	Structures comprising of a tubular tower, rotor blades, and a nacelle which houses the Wind Turbine generator.

Acronyms

Acronym	Definition
AL1	Action Level 1
AL2	Action Level 2
BSH	Broadscale habitat
Cefas	Centre for Environment, Fisheries, and Aquaculture Science
CSQG	Canadian Sediment Quality Guidelines
DDV	Drop Down Video
DVV	Dual Van Veen grab
eDNA	Environmental Deoxyribonucleic Acid
EIA	Environmental Impact Assessment
EMODNet	European Marine Observation and Data Network
ERL	Effects Range Low
ERM	Effects Range Median
EUNIS	European Nature Information System
IAC	Inter-Array Cable
IBTS	International Bottom Trawl Survey
ICES	International Council for the Exploration of the Seas
IEF	Important Ecological Feature
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide
MBES	Multibeam Echosounder
MHWS	Mean High Water Spring
MLWS	Mean Low Water Spring
MNCR	Marine Nature Conservation Review
MPA	Marine Protected Area
NMBAQC	North-east Atlantic Marine Biological Analytical Quality Control
NMPi	National Marine Plan interactive
NQ	Not Quantifiable
OEL	Ocean Ecology Limited
OSP	Offshore Substation Platform
OSPAR	Oslo-Paris [Convention]
OWF	Offshore Wind Farm
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PEL	Probable Effect Level
PMF	Priority Marine Feature
PRIMER	Plymouth Routines in Multivariate Ecological Research

Acronym	Definition
PSA	Particle Size Analysis
SAC	Special Area of Conservation
SACFOR	Superabundant, Abundant, Common, Frequent, Occasional, and Rare
SBP	Sub-Bottom Profiler
SD	Standard Deviation
SEPA	Scottish Environment Protection Agency
SIMPER	Similarity Percentages
SIMPROF	Similarity Profile
SMP	Sectoral Marine Plan
SSS	Side Scan Sonar
TEL	Threshold Effect Level
TOC	Total Organic Carbon
TOM	Total Organic Matter
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TWP	Thistle Wind Partners Limited
UHRS	Ultra High-Resolution Seismic
UK	United Kingdom
ZoI	Zone of Influence

Table of Units

Units	Definition
%	Percent
°C	Degree Celsius
kts	Knots
cm	Centimetre
kg	Kilogram
km	Kilometre
km^2	Square kilometre
L	Litre
m	Metre
m^2	Square Metre
mg/kg	Milligram per kilogram
ml	Millilitre
mm	Millimetre
pH	Potential of hydrogen (logarithmic scale used to specify the acidity or basicity of aqueous solutions)
μg/kg	Microgram per kilogram

1 Introduction

1.1.1 This Benthic Ecology Technical Report presents a detailed baseline characterisation of the benthic subtidal and intertidal ecology for the offshore elements of the Bowdun Offshore Wind Farm (OWF) Project (hereafter referred to as the Proposed Development). The Proposed Development covers the Option Lease Area (OLA) comprises of the Array Area, which is located in the E3 Plan Option Area (POA) detailed in the Scottish Sectoral Marine Plan (SMP) (Scottish Government, 2020), and the Export Cable Corridor. The Array Area is located 38 km from the Aberdeenshire coast at its closest point, covering an area of 187 km^2 and will comprise the Wind Turbines (fixed foundations), Inter-Array Cables (IACs), Offshore Substation Platforms (OSPs), Interconnector Cables, Offshore Export Cables and any necessary scour/cable protection. The Export Cable Corridor will include a maximum of three High Voltage Alternating Current (HVAC) Offshore Export Cables, each with a length of up to 70 km and will make Landfall at Benholm, Aberdeenshire.

1.1.2 Data were collated through a detailed desktop study of existing resources available for benthic subtidal and intertidal ecology within the region to gain a historical perspective of benthic ecology population dynamics at, and surrounding, the Proposed Development. Site specific surveys were also undertaken in 2023 and 2024, consisting of a Phase 1 intertidal walkover survey, and benthic subtidal survey, respectively.

1.1.3 The information in this technical report presents the baseline characterisation and informs the assessment of the likely significant environmental effects of the Proposed Development on benthic ecology receptors. This report accompanies the Environmental Impact Assessment (EIA) provided in Volume 2, Chapter 8: Benthic Ecology to support the consent application for the Proposed Development.

1.1.4 The aims of this Benthic Ecology Technical Report are to:

- provide a robust desktop baseline characterisation from the existing benthic subtidal and intertidal ecology resources within the defined Benthic Ecology Study Area;
- provide the results of site-specific benthic subtidal surveys within the Benthic Ecology Study Area and assign habitat types and biotopes; and
- identify the occurrence and distribution of any habitats or species of conservation interest or ecological importance to be taken forward for the assessment of impacts.

2 Benthic Ecology Study Area

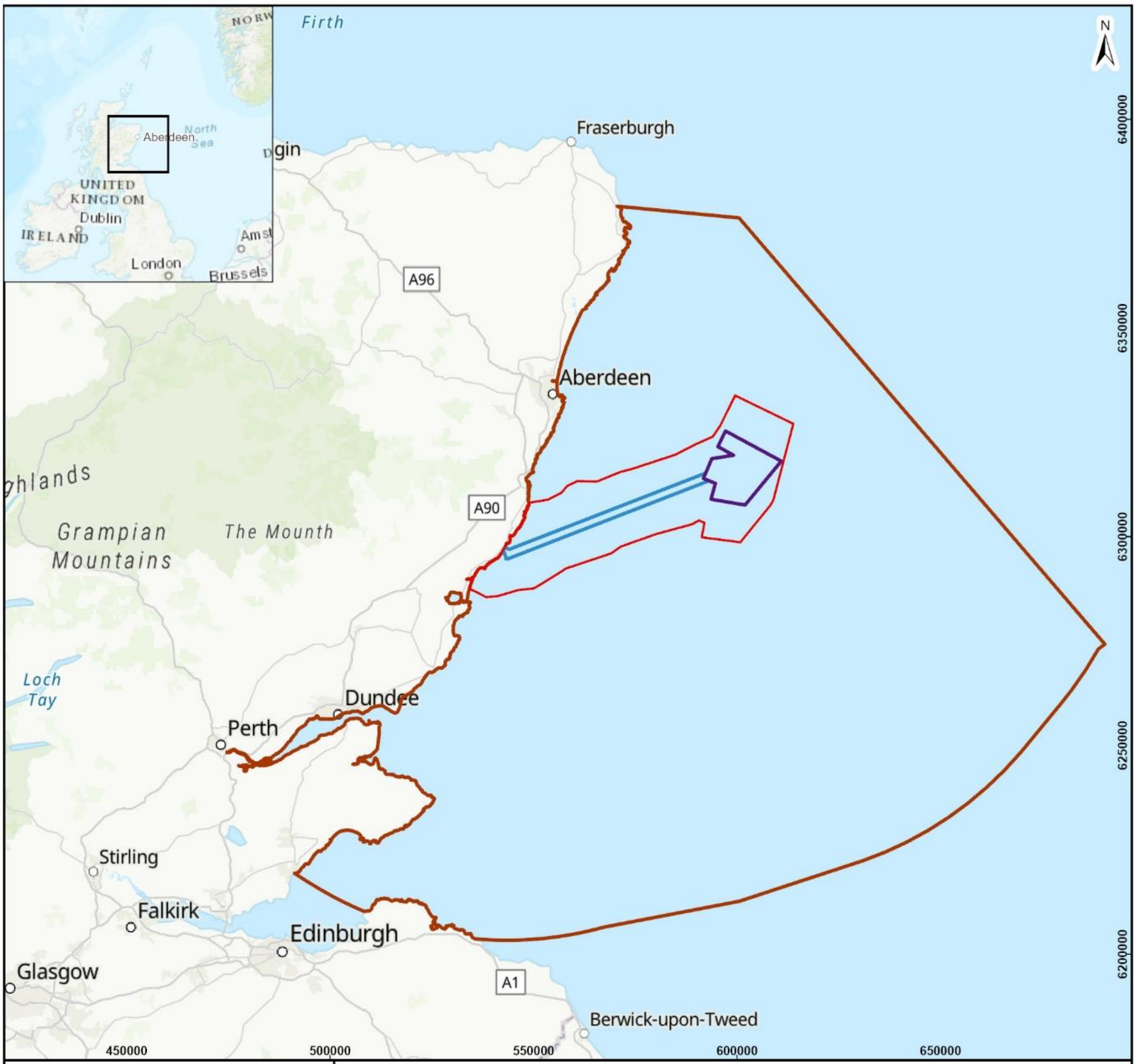
2.1.1 Two study areas are defined for benthic subtidal and intertidal ecology:

- the Regional Benthic Ecology Study Area; and
- the Local Benthic Ecology Study Area.

2.1.2 The Benthic Ecology Study Areas are shown in Figure 2.1 and defined as follows:

- The Regional Benthic Ecology Study Area includes the area encompassing the Site Boundary and extends further into the north of the North Sea. The Regional Benthic Ecology Study Area has been informed by the SMP East Region (Scottish Government, 2020). It also encompasses other OWF projects and regional datasets which can help characterise the baseline. The Regional Benthic Ecology Study Area has been defined to ensure a comprehensive baseline is provided and to provide wider context to the Local Benthic Ecology Study Area.
- The Local Benthic Ecology Study Area, which is defined as the area encompassed by the Site Boundary and a buffer of one spring Tidal Ellipse (modelled as ranging from 6.22 km to 9.42 km around the Site Boundary). The buffer of one Tidal Ellipse ensures the Local Benthic Ecology Study Area is large enough to account for the Zone of Influence (ZoI) of impacts to benthic ecology, which may extend beyond the Site Boundary, such as through increased Suspended Sediment Concentrations and changes in physical processes.

2.1.3 The Regional and Local Benthic Ecology Study Areas were presented and agreed during the Scoping Workshop, and it was agreed that the study areas were sufficient to account for the ZoI of impacts and appropriate for characterising benthic ecology. This was also confirmed in the Scoping Opinion (MD-LOT, 2024).



Project Title: Bowdun Offshore Wind Farm	**Figure Title:** Benthic Ecology Study Areas

LEGEND

- 🟪 Array Area
- 🟦 Export Cable Corridor
- 🟥 Local Benthic Ecology Study Area
- 🟫 Regional Benthic Ecology Study Area

0 2.5 5 10 15 20 25 30 nm
0 5 10 20 30 40 50 km

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

Data Sources: Client,

Service Layer Credits: World Topographic Map: Esri, HERE, Garmin, FAO, NOAA, USGS
World Topographic Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

VER	DATE	DETAILS	BY	CHK
00	16/10/24	First Issue	MJ	HM
01	23/10/24	Revision	MJ	HM
02	20/01/25	Revision	MJ	HM
04	10/10/25	Revision	MJ	CC

Drawing Number:
EOR0770A-ES-BEN-T001-04

THISTLE WIND PARTNERS
TETRA TECH RPS ENERGY

Figure 2.1: Benthic Ecology Study Areas

3 Methodology

3.1 Desktop Study

3.1.1 Information on the benthic subtidal and intertidal ecology within the Regional Benthic Ecology Study Area and the Local Benthic Ecology Study Area was collected through a detailed desktop review of existing studies and datasets. These sources are summarised in Table 3.1.

Table 3.1: Summary of Key Desktop Datasets and Reports for Benthic Subtidal and Intertidal Ecology

Title	Source	Extent	Year	Author
Marine Scotland National Marine Plan Interactive (NMPi) Maps	Marine Scotland	Regional Benthic Ecology Study Area	2025	(NMPi, 2025)
Marine Protected Area (MPA) Mapper	Joint Nature Conservation Committee (JNCC)	Regional Benthic Ecology Study Area	2025	(JNCC, 2025)
One Benthic Platform	Centre for Environment, Fisheries, and Aquaculture Science (Cefas)	Regional Benthic Ecology Study Area	2024	(Cefas, 2024)
European Marine Observation and Data Network (EMODnet) broadscale seabed habitat map for Europe (EUSeaMap)	EMODnet – Seabed Habitats	Regional Benthic Ecology Study Area	2024	(EMODnet, 2025)
Ossian Array EIA Scoping Report	Ossian OWF Limited	Ossian OWF	2023	(Ossian OWFL, 2023)
Morven Offshore Wind Array Project EIA Scoping Report	Morven Offshore Wind Limited	Morven OWF	2023	(MvOWL, 2023)
Berwick Bank Wind Farm Offshore EIA Report, Chapter 8 Benthic Subtidal and Intertidal Ecology	SSE Renewables	Berwick Bank OWF	2022	(SSE Renewables, 2022)
Annex I Reefs in United Kingdom (UK) Waters (Open Data)	JNCC	Regional Benthic Ecology Study Area	2021	(JNCC, 2021)
The Status of *Sabellaria spinulosa* Reef off the Moray Firth and Aberdeenshire Coasts and Guidance for Conservation of the Species off the Scottish East Coast	Marine Scotland Science (now Marine Directorate – Science, Evidence, Data and Digital)	Regional Benthic Ecology Study Area	2020	(Pearce and Kimber, 2020)

Title	Source	Extent	Year	Author
Annex I Sandbanks in the UK – Public Polygons	JNCC	Regional Benthic Ecology Study Area	2019	(JNCC, 2019)
Neart Na Gaoithe OWF Environmental Statement (ES), Chapter 14 – Benthic Ecology	Neart Na Gaoithe OWF	Neart Na Gaoithe OWF	2019	(Mainstream Renewable Power, 2019)
Inch Cape OWF Offshore ES, Volume 1B: Biological Environment, Chapter 12 Benthic Ecology	Inch Cape OWF	Inch Cape OWF	2018	(Inch Cape Offshore Limited, 2018b)
A big data approach to macrofaunal baseline assessment, monitoring and sustainable exploration of the seabed	Cefas	Regional Benthic Ecology Study Area	2017	(Cooper and Barry, 2017)
Kincardine Offshore Windfarm ES	Kincardine Offshore Windfarm Limited	Kincardine OWF	2016	(Kincardine OWF Limited, 2016)
Descriptions of Scottish Priority Marine Features (PMFs)	Scottish Natural Heritage (now NatureScot)	Regional Benthic Ecology Study Area	2016	(Tyler-Walters *et al.*, 2016)
Hywind Scotland Pilot Park: ES	Hywind Scotland	Hywind Scotland Pilot Park	2015	(Statoil, 2015)
Mapping habitats and biotopes from acoustic datasets to strengthen the information base of MPAs in Scottish Waters – Phase 2	JNCC	Regional Benthic Ecology Study Area	2014	(Sotheran and Crawford-Avis, 2014)
Analysis of seabed imagery from the 2011 survey of the Firth of Forth Banks Complex, the 2011 International Bottom Trawl Survey (IBTS) and additional deep-water sites from Marine Scotland Science surveys (2012)	JNCC	Regional Benthic Ecology Study Area	2014	(Axelsson *et al.*, 2014)
Biotope assignment of grab samples from four surveys undertaken in 2011 across Scotland's seas (2012)	JNCC	Regional Benthic Ecology Study Area	2014	(Pearce *et al.*, 2014)

Title	Source	Extent	Year	Author
Mapping habitats and biotopes from acoustic datasets to strengthen the information base of MPAs in Scottish Waters	JNCC	Regional Benthic Ecology Study Area	2013	(Sotheran and Crawford-Avis, 2013)
Seagreen Environmental Impact Statement, Volume 1, Chapter 11 Benthic Ecology and Intertidal Ecology	Seagreen Alpha and Bravo OWFs (have since been renamed to Seagreen 1 and Seagreen 1A)	Seagreen 1 OWF	2012	(Seagreen Wind Energy Limited, 2012)
European Offshore Wind Deployment Centre: Request for an EIA Scoping Opinion	Aberdeen OWF Limited (also referred to as the European Offshore Wind Deployment Centre)	Regional Benthic Ecology Study Area	2010	(Aberdeen OWF Limited, 2010)

3.2 Site-Specific Surveys

3.2.1 Three site specific surveys were undertaken within the Local Benthic Ecology Study Area: an intertidal Phase 1 walk over survey in 2023, a geophysical survey in 2024, and a benthic subtidal survey in 2024. A summary of the surveys undertaken to inform the benthic subtidal and intertidal ecology is outlined in Table 3.2 below.

Table 3.2: Summary of Site-Specific Surveys Undertaken for Benthic Subtidal and Intertidal Ecology

Title	Extent of Survey	Overview of Survey	Survey Contractor	Date	Reference to Further Information
Geophysical survey campaign	Across the Array Area and 1 km wide corridor within Export Cable Corridor (excluding the intertidal area)	High resolution Side-Scan Sonar (SSS), Sub-Bottom Profiler (SBP), Ultra High-Resolution Seismic (UHRS) and Multibeam Echosounder (MBES)	G-Tec	2023 & 2024	(G-Tec, 2024a, G-Tec, 2024b)
Benthic subtidal survey	Across the Array Area and Export Cable Corridor	Drop Down Video (DDV) and grab samples, to determine biotopes and sediment contamination.	Ocean Ecology Limited	2024	Volume 3, Technical Appendix 8.2: Bowdun OWF Benthic Characterisation Survey 2024: Survey Report
Phase 1 intertidal walkover survey	Intertidal Area at Landfall	Phase 1 intertidal walkover survey for biotope classification.	RPS	2023	Volume 3, Technical Appendix 4.1: Scoping Report, Appendix E Benthic Phase 1 Intertidal Walkover Survey Report

Geophysical Survey Campaign

3.2.2 G-tec undertook the geophysical surveys to classify the morphological area for the Export Cable Corridor from 05 May 2023 to 17 October 2023 and 23 March 2024 to 22 June 2024 using two vessels (the *Ondine Jule* and the *Manor Brunel*). The Array Area was surveyed between March 2023 and October 2023 and June 2024 to September 2024 using two vessels (*Mainport Geo* and *Karina*). The studies integrate MBES, SSS, Magnetometer, SBP, and UHRS data to characterise the seabed and subsurface features, identifying the potential risks and constraints for offshore infrastructure installation.

Benthic Subtidal Survey

3.2.3 Ocean Ecology Limited (OEL) undertook the benthic subtidal survey from 27 April to 14 May 2024. The sampling strategy was based upon the following sampling techniques:

- DDV;
- grab sampling; and
- water quality sampling and profiling.

3.2.4 Table 3.3 summaries the sample acquisition for each of the above sampling techniques at the Proposed Development. The sampling strategy was designed to characterise the benthic communities associated with all the broadscale habitats (BSH) and identify any potentially sensitive features within the Local Benthic Ecology Study Area. Water quality sampling was included to give a full profile of the environmental condition of the water column.

Table 3.3: Summary of Acquisition at the Proposed Development

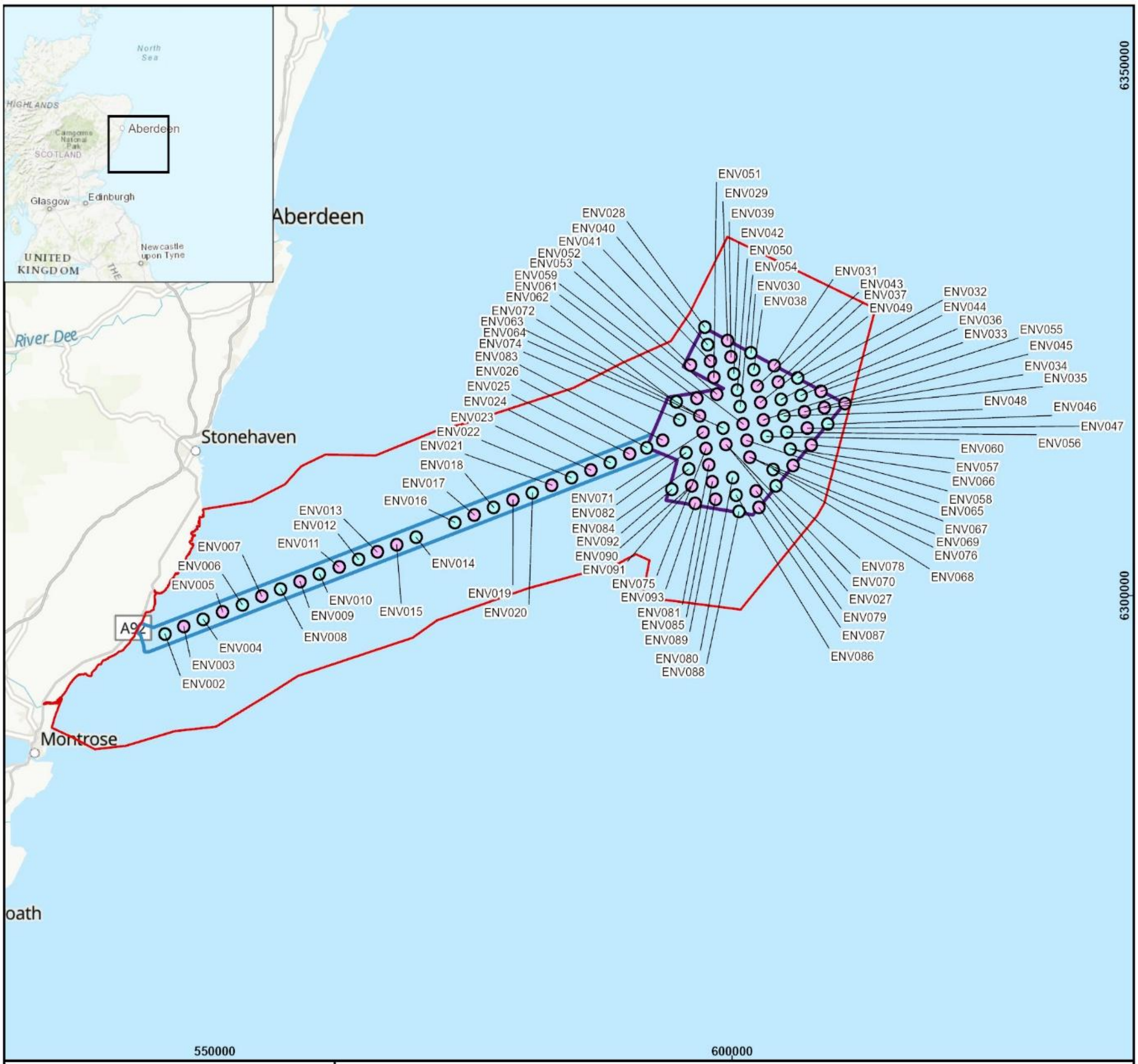
Acquisition	Sampling Stations	Replication	Total Samples
DDV	93	1	93
Grab Sampling	Macrofauna and Particle Size Analysis (PSA): 91 of the 93 stations	1	91
	Sediment contaminants: 46 of the above 93 stations	1	46
	Blue carbon: 16 of the above 93 stations	1	16
Water quality sampling and profiling	16 of the above 93 stations	3 (surface, mid-water, bottom)*	47

*One station was <30 m water depth and therefore required only surface and bottom water sampling.

3.2.5 Achieved sediment and camera samples with their corresponding station names are presented in Figure 3.1.

Survey Limitations

3.2.6 Sampling for one station (ENV073, within the Array Area) was abandoned following failed attempts due to the hard substrate. One station (ENV001) was not grab sampled due to the presence of potential reef habitat in the DDV imagery. The grab samples were mostly successful using the Dual Van Veen grab (DVV) grab sampler, but three stations (ENV056, ENV067, ENV072) required the use of a 0.1 m^2 Hamon grab following failed attempts using the DVV grab sampler. These three stations were successfully sampled for PSA and infauna. Station ENV077 was successfully sampled for sediment contamination after one attempt at the target location, with DDV covering the same location. Infaunal and PSA sampling was successful on the fourth attempt at 50 m away from the original location and using a Hamon grab. The Hamon grab data were not available for statistical analyses.



Project Title: Bowdun Offshore Wind Farm

Figure Title: Achieved Sediment Sampling and DDV Surveys

LEGEND

- ▢ Array Area
- ▢ Export Cable Corridor
- ▢ Local Benthic Ecology Study Area
- ○ Macrofauna/PSA/DDV
- ● Macrofauna/PSA/DDV/Chemistry

0 2.5 5 10 nm
0 5 10 20 km

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

VER	DATE	DETAILS	BY	CHK
00	23/10/24	First Issue	MJ	HM
01	20/01/25	Revision	MJ	HM
02	25/06/25	Revision	MJ	HM
03	10/10/25	Revision	MJ	SW

Drawing Number:
EOR0770A-ES-BEN-T005-03

Data Sources: Client,

Service Layer Credits: World Topographic Map: Esri, HERE, Garmin, FAO, NOAA, USGS
World Topographic Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Figure 3.1: Achieved Sediment Sampling and DDV Surveys

Drop Down Video

3.2.7 At each of the 93 sampling stations, high-resolution seabed imagery (stills and video) was first collected using a drop-down camera to determine the suitability of the station for grab sampling (i.e. no hazards or sensitive habitats present), and to provide an indication of the epibenthic biota at each location. The camera used was OEL's SubC Rayfin powerline ethernet camera system, set up to obtain 1080p high-definition video and 20 megapixel still images, with a light emitting diode strip lamp and 10 cm point dual laser scaling units projected into the field of view.

3.2.8 All DDV stations were sampled in consideration of the JNCC epibiota remote monitoring guidelines (Hitchin *et al.*, 2015). The camera system was deployed from the hydraulic 'A' frame on the aft deck of the Diving Support Vessel *Curtis Marshall*, with the camera raised using the A-frame and coaxial winch and lowered into the water column at the correct position. Once within 5 m of the seabed, video recording was started, with the camera then gently lowered to the seabed.

3.2.9 The vessel followed an approximate transect across the target location at a speed of 0.5 kts, periodically taking still images and continually recording video of the seabed. A minimum of five still images within 20 m of the target location were taken per transect, and a minimum of five minutes of video was recorded per transect. Following completion of the DDV at each location, the camera was recovered aboard, and the images were reviewed by the lead marine ecologist, with any sites not meeting minimum footage times and photo numbers revisited to obtain more imagery.

3.2.10 Videos were recorded in a digital format direct to topside hard disk drives and digitally overlaid retrospectively with information including project, date, time, depth, and coordinates. Detailed notes were taken of visible sediment conditions and seabed features, obvious fauna, and habitat-related features whilst in the field.

Grab Sampling

3.2.11 Grab sampling was undertaken successfully at 91 stations (excluding the abandoned station ENV073, and station ENV001 due to the presence of potential reef), to collect a macrofaunal and PSA sample. Most stations were sampled using a 0.2 m^2 (2 x 0.1 m^2) DVV grab sampler, and five stations were sampled using a 0.1 m^2 Day grab after three DVV collection failures. Sediments were also sub-sampled for contaminant analysis at 46 of the stations, and blue carbon at 16 stations (Table 3.3, Annex B – Annex E).

3.2.12 To ensure validity and consistency, grab samples were screened by the lead environmental scientist against exclusion criteria including the grab being less than 50% full or the jaws being jammed open.

3.2.13 Initial processing of all grab samples was undertaken aboard the survey vessel in line with the following methodology:

- an initial visual assessment was made of sample size and acceptability;
- a photograph was taken of the sample with date, station details, and scale bar;
- 450 ml to 500 ml of the first sample was removed for PSA analysis, transferred to a labelled tray, and frozen at -18°C in an onboard freezer;
- the remaining portion of the first sample was emptied into a 0.5 mm sieve net laid over a 4.0 mm sieve table and washed by gently rinsing with a seawater hose;
- the remaining sample for faunal sorting and identification was first photographed, then backwashed into a suitably sized sample container using seawater. Diluted 10% formalin solution was added to preserve the sample prior to laboratory analysis;
- the sample container was labelled internally and externally with sample ID, sample type, and project name; and
- detailed field notes were taken including station number, fix (position) number, number of attempts, sample volume, sediment type, conspicuous fauna, any sign of protected features, and water depth (with all depths referenced to lowest astronomical tide (LAT) (Ocean Ecology, 2024)).

3.2.14 At stations where sampling of contaminants was required, the following methods were also applied, in addition to those above:

- prior to the sample being taken, the inside of the grab was sprayed with acetone and rinsed with de-ionised water;
- during sample inspection, special care was taken to ensure the surficial sediments of the second sample were not disturbed and that there was no contamination of the sample once the inspection hatch was opened;
- sediment samples were sub-sampled from the surface 2 – 3 cm of the second sample and decanted into a sterile 500 ml plastic tub and two sterile 120 ml amber jars, filling each container completely. The amber jars were sealed with a foil liner. These sample containers were recommended and provided by SOCOTEC, the contaminant laboratory specialists for the required chemical analyses;
- the samples were then frozen immediately at -18°C in an onboard freezer; and
- a second set of 'B replicate' chemical sub-samples were taken from the remaining sediment, following the same process, in case of a need for re-analysis or the primary sub-samples becoming compromised prior to analysis.

3.2.15 At stations where sampling of blue carbon was required, the following methods were also applied, in addition to those above:

- sediment samples were sub-sampled from the second sample and decanted into a 1 L plastic tub and 500 ml plastic tub. These were then frozen immediately at -18°C in an onboard freezer; and
- a second set of ‘B replicate’ blue carbon sub-samples were taken from the remaining sediment, following the same process, in case of a need for re-analysis or the primary sub-samples becoming compromised prior to analysis.

3.2.16 The results of the Blue Carbon analysis will be presented within Volume 2, Chapter 22: Climatic Change.

Water Sampling

3.2.17 Water samples were collected at 16 stations using a 5 L or 10 L Niskin bottle which was cleaned with 10% bleach solution then rinsed with deionised water. At the stations where seawater sampling was required, water samples were collected at three depths for each relevant station, targeting the surface, midwater, and just above the seabed. One station was < 30 m water depth and therefore required only surface and bottom water sampling. Stations were sub-sampled for the following parameters into the required laboratory containers and frozen at -18°C in an onboard freezer:

- heavy and trace metals;
- Total Organic Carbon (TOC);
- total suspended solids (TSS);
- nutrients;
- Total Petroleum Hydrocarbons (TPH);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- chlorophyll a; and
- Environmental Deoxyribonucleic Acid (eDNA).

3.2.18 Profiling of the water column was also undertaken using an EXO3 multiparameter sonde, measuring:

- conductivity;
- temperature;
- depth;
- dissolved oxygen;
- turbidity; and
- pH.

3.2.19 The results of the water sampling analysis will be presented in Volume 2, Chapter 22: Climatic Change.

Sample Analysis

DDV Analysis

3.2.20 Digital photographic stills and video footage were successfully obtained along all transects and subsequently analysed to aid in the identification and delineation of seabed habitats. All seabed imagery analysis was undertaken using the Bio-image Indexing and Graphical Labelling Environment (BIIGLE2) annotation platform (Langenkämper *et al.*, 2017) and in line with JNCC epibiota remote monitoring interpretation guidelines (Turner *et al.*, 2016).

3.2.21 Analysis of still images was undertaken in two stages. The first stage, 'Tier 1', consisted of labels that referred to the whole image being assigned, providing appropriate metadata for the image. The second stage, 'Tier 2', was used to assign percentage cover of habitat types by drawing polygons to inform the habitat assessment process. This analysis produced a list of discrete taxa identified and their abundance (number of individuals), or percentage cover for colonial organisms, within each image at each sampling station. It also identified burrows, grouping them into size categories to give the number and size of burrows per image at each sampling station.

Benthic Infaunal Analysis

3.2.22 The benthic macrofaunal analysis was undertaken by OEL following the North-East Atlantic Marine Biological Analytical Quality Control (NMBAQC) Scheme's best practice guidelines (Worsfold and Hall, 2010) for identification (to species level), enumeration and biomass determination. Biomass of the infaunal component was recorded from the ash free dry mass, in grams. The retained infauna was separated into the following phyla: Polychaeta; Crustacea; Echinodermata; Mollusca, and Others.

3.2.23 The epifaunal components of each sample was analysed separately with identification to species level. Where possible each component was enumerated and presented as discrete counts or, in the case of colonies, recorded as present and given a P (present) value.

Sediment Characteristics Analysis

3.2.24 The PSA was carried out by OEL in accordance with NMBAQC best practice guidance (Mason, 2022). A sub-sample was taken from each homogenised sample and washed over a 1 mm sieve to determine analysis methodology. Where no material from the sub-sample was retained on the 1 mm sieve, the sample was classified as sands, muds, and muddy sands, meaning only laser diffraction was required. When material was retained on the 1 mm sieve, the sample was classified as a diamictons, and both sieve and laser diffraction methodologies were carried out.

3.2.25 The particle size distribution of the <1 mm sediment was measured using a laser diffraction particle size analyser. The >1 mm sediment was oven dried and sieved as 0.5 phi intervals using a sieve shaker; the weights of the sediment retained on each sieve were recorded to two decimal places.

3.2.26 Following data quality control, the sieve and laser data were merged to produce a continuous particle size distribution for each sample, which was used to obtain sample statistics.

Sediment Chemistry Analysis

3.2.27 Chemical analyses were performed by SOCOTEC for the following contaminants:

- Total Organic Matter (TOM);
- TOC;
- metals;
- TPH;
- Polychlorinated Biphenyls (PCBs); and
- PAHs.

Seawater Sample Analysis

3.2.28 The seawater analysis was undertaken by SOCOTEC for the following contaminants:

- heavy and trace metals;
- TOC;
- TSS;
- nutrients;
- TPH;
- PAHs; and
- chlorophyll a.

eDNA Sample Analysis

3.2.29 The eDNA sample analysis was undertaken by Naturemetrics Limited., with DNA extracted from each sample and amplified using triplicate polymerase chain reactions. Sequence data were processed for quality filtering and taxonomic assignment, with each taxonomic unit assigned by being compared to two reference databases. Minimum similarity threshold of 98%, 95%, and 92% were required for species, genus, and high-level assignments, respectively. Assignments were made to the lowest possible taxonomic level where there was consistency in the matches. The full results are presented in Annex I.

Intertidal Survey

3.2.30 The full intertidal survey report is provided in Volume 3, Technical Appendix 4.1: Scoping Report Appendix E Benthic Phase 1 Intertidal Walkover Survey Report. The following guidelines were consulted to determine the intertidal survey methodology to be engaged for the Proposed Development:

- the Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey (Wyn *et al.*, 2006);
- the Procedural Guidance No 3-11 *in situ* Biotope Recording (Wyn and Brazier, 2001);
- the JNCC Marine Monitoring Handbook (Davies *et al.*, 2001); and
- the Marine Nature Conservation Review (MNCR): Rationale and methods. Coasts and seas of the UK (Hiscock, 1996).

3.2.31 Seven vertical transects were sampled to ensure comprehensive coverage of the intertidal survey area, which covered approximately the width and length (approximately 2.25 km) of the safely accessible Benholm beach area between Mean Low Water Springs (MLWS) and Mean High Water Springs (MHWS) that the Export Cable Corridor would be expected to pass through (Figure 5.15). The survey transects provided information on the strandline, upper shore, mid shore, and lower shore zones. Where possible, four quadrats per shore area were sampled and photographed to support a detailed assessment and biotope identification. Visual walkovers were conducted at each survey transect, and quadrats provided quantitative assessment of algal coverage and epifaunal assemblages. No sedimentary areas were present on the shore to undertake dig-overs, therefore the results were based upon walkover observations and quadrat results only.

Data Analysis

Sediment Characteristics Analysis

3.2.32 The PSA data were categorised using the Folk classification which groups particles into three main size categories: mud (up to 0.0625 mm), sand (>0.0625 mm and <2 mm) and gravel (>2 mm) (Folk, 1954). The relative proportion of each main sediment fraction was used to ascribe the sediment to one of 15 classes (e.g. slightly gravelly sand, muddy sand etc.) (Folk, 1954, Long, 2006). These classifications were then used to describe the data in the analysis. Statistics are based on the Folk and Ward (1957) method, which was used to describe the sediment data. Folk and Ward includes statistics such as the sorting coefficient, which describes the extent of deviation from lognormality of the particle size distribution (i.e. the variation in particle size with a sample).

Sediment Chemistry Analysis

3.2.33 The results of the sediment chemistry analysis were compared to the Marine Scotland Action Levels (Marine Scotland, 2017). Marine Scotland Action Level 1 (AL1) and Action Level 2 (AL2) are thresholds which give an indication of how suitable the sediments are for disposal at sea. Contaminant levels which are below AL1 are of no concern and are unlikely to influence the marine licensing decision, while sediments with contaminant levels above AL2 are considered unsuitable for disposal at sea. Those between AL1 and AL2 require further consideration before a marine licensing decision can be made.

3.2.34 Sediment chemistry data were also compared to the Canadian Sediment Quality Guidelines (CSQG) (CCME, 2017). These thresholds give an indication of the degree of contamination and the likely impact on marine ecology. For each contaminant, the guidelines provide a Threshold Effect Level (TEL), which is the minimal effect range at which adverse effects rarely occur, and a Probable Effect Level (PEL), which is the probable effect range within which adverse effects frequently occur. For PAHs, the best estimates of the potential toxicity of marine sediments are Effects Range Low (ERL) and Effects Range Median (ERM) concentrations for total low molecular weight, total high molecular weight, and total PAHs (Neff, 2002). These thresholds were used for comparison with the results of the sediment chemistry analysis.

Macrofaunal Analysis

Data Rationalisation

3.2.35 The benthic infaunal and epifaunal datasets were handled as both untransformed and transformed sets, with a square root transformation used specifically to down-weight the species with the highest abundances for multivariate community analysis. The analysis of the infaunal community was made using the enumerated taxa only dataset to avoid skewing the results with the encrusting/colonial taxa recorded as 'present'; these encrusting/colonial taxa were combined with the DDV data and analysed separately.

3.2.36 Juveniles of some species were recorded in the raw infaunal data, including species such as the echinoderms Amphiuridae sp. and Ophiuridae sp., and the annelids Opheliidae sp., *Lumbrineris cingulata*, and Glycera sp. Juveniles represented only a small proportion of the overall population, with no statistical difference noted between the datasets including and excluding juveniles, and they were therefore included in the analysis to best characterise the habitats present.

3.2.37 Colonial/encrusting taxa within the grab samples, which were recorded only as present/absent, were combined with the DDV data and given an abundance of 1 or 0 respectively to enable them to be included in a separate multivariate analysis. Epifaunal data were recorded as present/absent and therefore removed from the infaunal grab data analysis but were included in the epifaunal analysis.

3.2.38 All fish species were removed prior to analysis and are discussed separately within Volume 3, Technical Appendix 9.1: Fish and Shellfish Ecology Technical Report.

Univariate Analysis

3.2.39 The untransformed benthic infaunal data, and combined DDV and grab epifaunal data were summarised to highlight the number of individuals and number of taxa recorded. Analysis was also undertaken to identify the percentage composition of the major taxonomic groups within each sample station, the percentage contribution of each taxonomic group to the total number of taxa and the total number of individuals.

3.2.40 Several univariate indices were calculated for each sample to further describe the untransformed infaunal and epifaunal data, including: S = number of species; N = abundance; B = Biomass (wet mass); d = Margalef's index of Richness; J' = Pielou's Evenness index; H' = Shannon-Wiener Diversity index; λ = Simpson's index of Dominance.

Multivariate Community Analysis

3.2.41 The benthic infaunal grab data and combined DDV and grab epifaunal data were analysed using the Plymouth Routines in Multivariate Ecological Research (PRIMER) v6 software (Clarke and Gorley, 2015).

3.2.42 To determine the relative similarities between stations, the benthic infaunal and epifaunal community structure were investigated using CLUSTER analysis (hierarchical agglomerative clustering). Separate multivariate analyses were undertaken on the infaunal and epifaunal datasets, although the same methodology was used for both. Specifically, the Bray Curtis similarity coefficient was calculated to assess the similarity of stations based on the taxa present. This produced a dendrogram indicating the relationships between stations graphically, based on the similarity matrix and used a Similarity Profile (SIMPROF) test (at a 5% significance level) to test whether the differences between the identified clusters were significant.

3.2.43 Similarity Percentages (SIMPER) analyses were subsequently undertaken on the separate infaunal and epifaunal datasets to identify which species best explained the similarity within groups and the dissimilarity between groups identified in the CLUSTER analysis. The similarity matrix was also used to produce a Multi-Dimensional Scaling ordination plot to show, on a two or three-dimensional representation, the relatedness of the communities (at each site) to one another. Full methods for the application of both the hierarchical clustering and the multi-dimensional scaling analysis are given in (Clarke and Gorley, 2015).

Biotope Allocation

3.2.44 The results of the CLUSTER analyses and associated SIMPER outputs were reviewed alongside the raw, untransformed data to assign biotopes according to the Marine Habitat Classification for Britain and Ireland system (Connor *et al.*, 2004). Using the identified clusters, several sites within a cluster and, where appropriate several clusters, were assigned to a single biotope, based on relatedness and presence of key indicator species for a particular biotope. The infaunal and epifaunal biotopes were plotted over the results of the geophysical survey campaign for the Local Benthic Ecology Study Area. The geophysical data (i.e. sediment classification and seabed features) were used to map the distribution, extent and boundaries of each biotope resulting in the generation of infaunal and epifaunal biotope maps. The infaunal and epifaunal biotope allocations were combined to provide a final combined biotope map.

Habitat Analysis

3.2.45 The DDV was deployed prior to the deployment of the grab at every combined grab/DDV sample location to determine whether Annex I reef was present, such that grab sampling could be avoided in these areas. Sampling at two stations (ENV001 and ENV073) was abandoned due to the presence of hard substrates meaning these stations were unsuitable for grab sampling.

Stony Reef Assessment

3.2.46 Where coarse, stony, or rocky substrate was observed in the DDV footage of the Local Benthic Ecology Study Area, a stony reef assessment according to the appropriate guidance (Golding *et al.*, 2020, Irving, 2009) was undertaken to determine if stony reef was present. The assessment comprised a measure of elevation and patchiness, and extent where possible, as outlined in Table 3.4. The proposed scoring system (Irving, 2009) and a 'reefiness' matrix (Jenkins *et al.*, 2015) were used to interpret the 'reefiness' of stony features (Table 3.4). The conclusion of the Irving (2009) guidance was that a reef should be elevated above the sea floor, have an area of at least 25 m^2 and have a composition of no less than 10% coverage of the seabed. This guidance also recommended that, when determining whether an area of the seabed should be considered as Annex I stony reef, if a 'low' is scored in any of the four characteristics (composition, elevation, extent, or biota) then a strong justification would be required for this area to be considered as contributing to the Marine European Sites with qualifying reef features. Further guidance was provided (Golding *et al.*, 2020) on the interpretation of the guidance set out in Irving (2009) and these have therefore been reviewed together.

3.2.47 Where bedrock was observed in the DDV footage, a rocky reef assessment was undertaken. Unlike stony reef, there is little guidance for classifying bedrock reef. The elevation assessment criteria do not apply to bedrock reef. Therefore, bedrock reef was assessed on cover and extent alone, using the same thresholds as for stony reef, listed in Table 3.4.

Table 3.4: Stony Reef Assessment Matrix (Based on (Irving, 2009) and (Jenkins *et al.*, 2015))

Characteristic	**Resemblance to being a stony reef**			
	Not a stony reef	**Low**	**Medium**	**High**
Composition (% cover)	<10	10 to 40, Matrix supported	40 to 95	>95, Clast supported
Notes: Diameter of cobbles/boulders being greater than 64 mm. Percentage cover relates to a minimum area of 25 m^2. This ‘composition’ characteristic also includes ‘patchiness’.				
Elevation	Flat seabed	<64 mm	64 mm to 5 m	>5 m
Notes: Minimum heigh (64 mm) relates to the minimum size of constituent cobbles. This Characteristic could also include ‘distinctness’ from the surrounding seabed. Note that two units (mm and m) are used here.				
Extent	<25 m^2	>25 m^2		
Biota	Dominated by infaunal species	Scale of percentage coverage. ⟺		>80% of species present composed of epifaunal species

Biogenic Reefs – Sabellaria spinulosa

3.2.48 The ‘reefiness’ scale was used to quantify *S. spinulosa* reefs, which is based largely on results of an inter-agency workshop run by JNCC to help define and manage *S. spinulosa* reefs and reported in Gubbay (2007). This gave a range of elevations, area coverage and patchiness metrics against which to compare potential *S. spinulosa* reefs, with definitions provided for ‘Not a reef’, ‘Low’, ‘Medium’, and ‘High’ resemblance reefs, as shown in Table 3.5.

Table 3.5: Range of Measures to Define *Sabellaria spinulosa* ‘Reefiness’

Measure of ‘reefiness’	**Not a Reef**	**Low**	**Medium**	**High**
Elevation (cm) (average tube height)	<2	2 to 5	5 to 10	>10
Area (m^2)	<25	25 to 10,000	10,000 to 1,000,000	>1,000,000
Patchiness (% cover)	<10	10 to 20	20 to 30	>30

3.2.49 The images and DDV footage acquired at all stations were analysed and metrics were assigned when *S. spinulosa* individuals were found, from which their ‘reefiness’ could be estimated.

Biogenic Reefs – Modiolus modiolus

3.2.50 The mussel *M. modiolus* acts as a foundation species in diverse biogenic reefs that are characterised by clumped mussels and shell covering more than 30% of the substrate, which may be infaunal or embedded reefs, semi-infaunal (with densities of greater than five live individuals per m^2) or form epifaunal mounds (standing clear of the substrate with more than ten live individuals per clump), all of which support communities with high diversity compared to the surrounding area (Morris, 2015).

3.2.51 To assess for presence of mussel reef, assessment criteria established from an inter-agency workshop relating to *M. modiolus* reef (Morris, 2015) are used. Firstly, (Morris, 2015) identified three primary (Stage 1) factors, all of which must be met before assessing the confidence for Annex I designation:

- presence of live adult *M. modiolus* individuals;
- the biota/communities are distinct from the surrounding habitat; and
- the distinct region containing *M. modiolus* is greater than 25 m^2 in extent.

3.2.52 If the three Stage 1 factors are met, the Stage 2 assessment involves defining percentage cover, the number of individuals of *M. modiolus*, and the elevation of reef structures relative to the surrounding substrate to confirm if the structure can be classified as an Annex I biogenic reef.

Seapen and Burrowing Megafauna Communities

3.2.53 The 'seapen and burrowing megafauna communities' habitat is classified as a threatened and/or declining habitat (OSPAR Commission, 2008b) and is a PMF in Scottish waters (NatureScot, 2020). At stations where burrows were sufficiently large enough to indicate the presence of burrowing megafauna, an assessment was undertaken to determine whether the OSPAR 'seapen and burrowing megafauna communities' habitat was present. As detailed in the clarification document for defining this habitat (Robson, 2014) video and still imagery was assessed to confirm burrows and/or mounds and, where present, seapens.

3.2.54 The density classifications as laid out by the MNCR (Super-abundant, Abundant, Common, Frequent, Occasional and Rare (SACFOR) abundance scale (JNCC, 2013). The guidance (Robson, 2014) specifies that multiple sightings of burrows and/or mounds attributable to relevant species together with seapens, if present, should be classified as at least 'frequent' for their size on the SACFOR scale for the area to be considered a 'seapen and burrowing megafauna communities' habitat. However, it acknowledges the inherent difficulties of identifying species from burrow type alone. Therefore, the overall density of burrows was assessed, to consider whether their density was a 'prominent' feature of the sediment surface and potentially indicative of a sub-surface complex gallery burrow system.

3.2.55 The average burrow and seapen densities were calculated for each station using the total area covered by the seabed imagery (average swathe width x camera transect length). Average image swath width was calculated on a per station basis using the laser scaling present within the image to provide an estimate of the swathe covered by that image.

Fragile Sponge and Anthozoan Communities on Subtidal Rocky Habitats

3.2.56 Recent attempts to formally quantify a threshold for what density of sponges defines a deep-sea sponge habitat have been made by Det Norske Veritas (DNV, 2013) and the JNCC (Henry and Roberts, 2014). The DNV approach suggests that images with >10% sponge cover could constitute an OSPAR deep-sea sponge aggregation (DNV, 2013). In contrast, the methods proposed by the JNCC (Henry and Roberts, 2014) uses a variety of quantitative approaches. These include assessment of images of areas with raw densities of 0.5-24 sponges per m^2, occurrences of sponges categorised as at least “frequent” under the MNCR SACFOR scale, and use of multivariate SIMPER metric to determine if sponges are characteristic of the observed assemblages. The DNV (2013) method (% cover) was used in the assessment for this habitat.

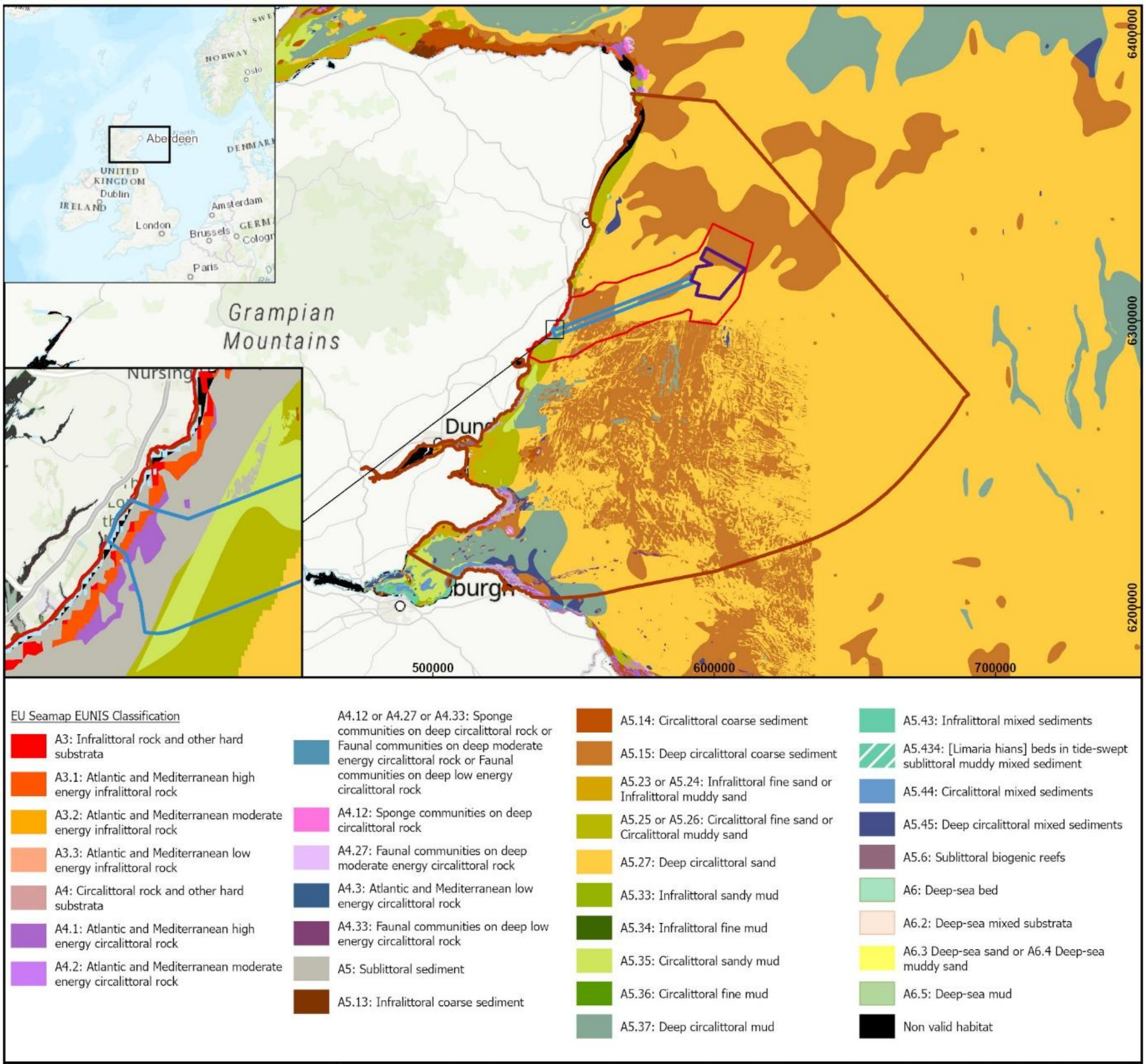
4 Baseline Characterisation – Desktop study

Seabed Sediments

Regional Benthic Ecology Study Area

4.1.1 The EUSeaMap data (EMODnet, 2025) provide broad-scale seabed sediment classifications in European waters, including the European Nature Information System (EUNIS) classification. These EUSeaMap data illustrate that seabed sediments within the Regional Benthic Ecology Study Area largely comprise deep circalittoral sand (EUNIS classification: A5.27) and deep circalittoral coarse sediment (A5.15). The following seabed classifications are present further inshore: circalittoral fine sand or circalittoral muddy sand (A5.25 or A5.26), circalittoral sandy mud (A5.35), deep circalittoral mud (A5.37), circalittoral coarse sediment (A5.14), and Atlantic and Mediterranean moderate energy circalittoral rock (A4.2) (Figure 4.1).

4.1.2 Similarly, surveys (Sotheran and Crawford-Avis, 2014) mapped habitats and biotopes in the eastern approaches to the Firth of Forth and recorded the following sediment classifications in the south of the Regional Benthic Ecology Study Area: circalittoral coarse sediment (A5.14), circalittoral muddy sand (A5.26), and deep circalittoral sand (A5.27).



Project Title: Bowdun Offshore Wind Farm

Figure Title: EU Seamap broad scale sediment classifications within the Regional Benthic Ecology Study Area

LEGEND

- Array Area
- Export Cable Corridor
- Local Benthic Study Area
- Regional Benthic Ecology Study Area

0 5 10 20 30 40 nm
0 10 20 40 60 80 km

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

Data Sources: Client, EMODnet

Service Layer Credits: World Topographic Map: Esri, HERE, FAO, NOAA
World Topographic Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

VER	DATE	DETAILS	BY	CHK
00	16/10/24	First Issue	MJ	HM
01	23/10/24	Revision	MJ	HM
02	25/06/25	Revision	MJ	HM
03	10/10/25	Revision	MJ	SW

Drawing Number:
EOR0770A-ES-BEN-T002-03

Figure 4.1: EU Seamap Broad Scale Sediment Classifications within the Regional Benthic Ecology Study Area

Local Benthic Ecology Study Area

4.1.3 The Local Benthic Ecology Study Area is dominated by deep circalittoral sand (A5.27), with an area of deep circalittoral coarse sediment (A5.15) along the northern edge (Figure 4.1). The Export Cable Corridor passes through both these habitats, before it intersects with circalittoral fine sand or circalittoral muddy sand (A5.25 or A5.26), circalittoral sandy mud (A5.35), and another area of deep circalittoral coarse sediment (A5.15) at the Landfall.

Subtidal Benthic Communities

Regional Benthic Ecology Study Area

4.1.4 The results of a broadscale baseline assessment of the UK's macrobenthic infauna is provided by (Cooper and Barry, 2017). Although the study focussed on the aggregates industry, data were collated from various industries, including renewables, oil and gas, nuclear, and port and harbour sectors. Thus, these findings are useful to characterise the Regional Benthic Ecology Study Area. The study categorised benthic macrofaunal communities into broad groups, based on similarities in their community composition. Within the Regional Benthic Ecology Study Area, data were largely characterised by polychaete communities (Spionidae, Glyceridae, Terebellidae, Capitellidae and Phyllodocidae).

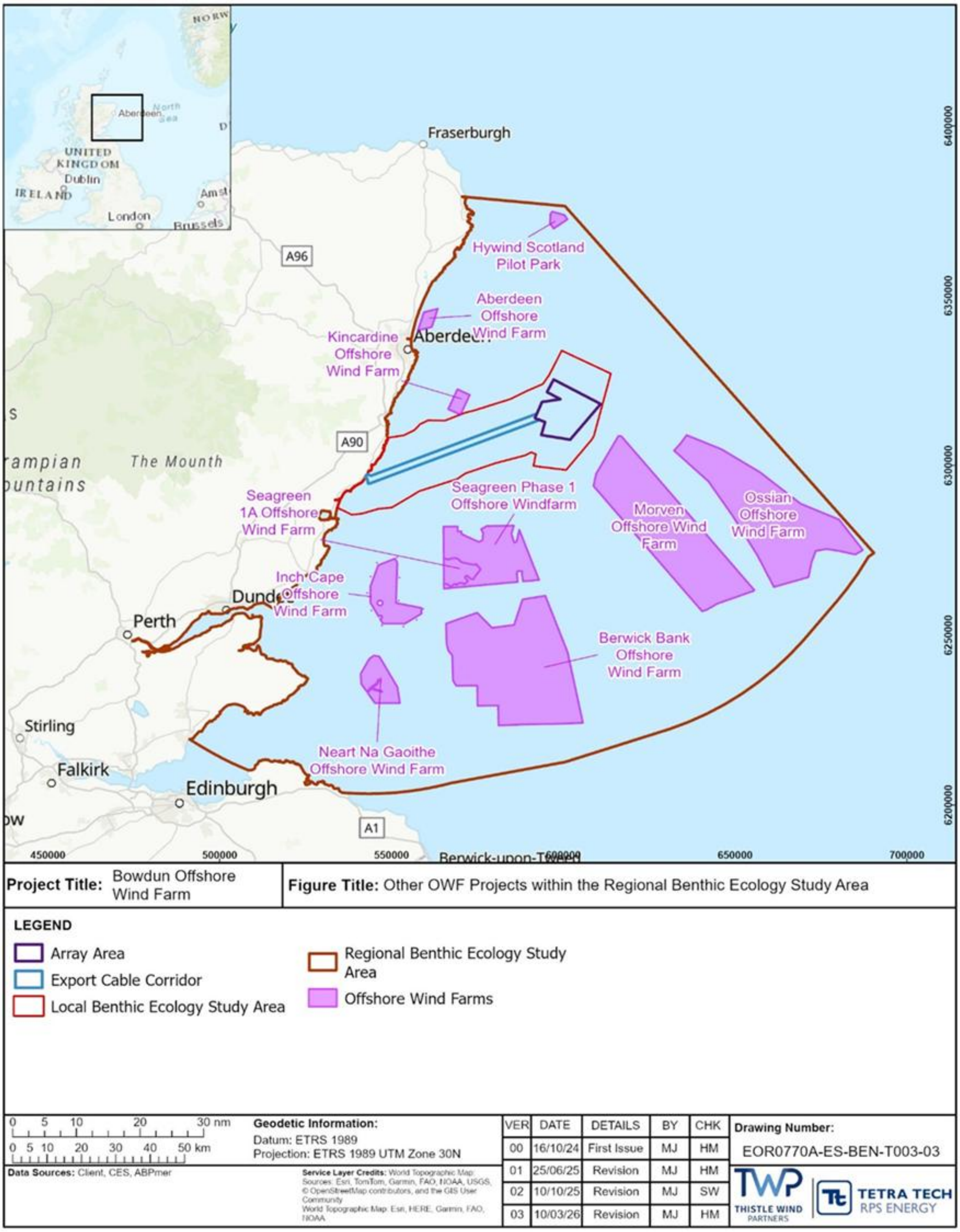
4.1.5 There are several other OWF projects within the Regional Benthic Ecology Study Area which have data available from site-specific benthic surveys (Table 4.1). The results of site-specific surveys conducted for these projects provide information to support the baseline. An overview of the subtidal benthic communities recorded in these surveys is presented in Table 4.1 and Figure 4.2.

Table 4.1: Overview of Benthic Communities Identified from Other OWF Projects within the Regional Benthic Ecology Study Area

Project	Distance from the Array Area (km)	Distance to the Export Cable Corridor (km)	Overview of benthic communities recorded	Source
Morven OWF (Since scoping Morven has now been split into Morven South and Morven North)	10.03	22.20	Site-specific DDV and grab sampling were conducted in spring and summer 2022. Soft substrates were dominated by annelids (Polychaeta), arthropods (Malacostraca), cnidarians (Anthozoa), echinoderms (Asteroidea, Holothuroidea, Echinoidea, and Ophiuroidea), and bivalve and gastropod molluscs. Fewer species were recorded on coarser sediments, such as gravel, cobbles, and boulders. No habitats of conservation importance were identified. The scarce tube-dwelling anemone *Arachnanthus sarsi* was recorded across eight sampling stations.	(MvOWL, 2023)
Kincardine OWF	20.14	7.63	Site-specific grab sampling and DDV surveys were conducted in summer 2013 and 2014. Offshore deep circalittoral habitats with fine sands or non-cohesive muddy sands were present throughout the Kincardine study area. Frequently observed species were the soft coral dead man's fingers *Alcyonium digitatum*, starfish *Asterias rubens*, and bryozoans (such as *Flustra foliacea*).	(Kincardine OWF Limited, 2016)
Ossian OWF	25.36	40.14	Site-specific epibenthic beam trawling, grab sampling, and DDV surveys were conducted in July 2022. Faunal composition was dominated by annelids, mainly the sand mason worm *Lanice conchilega*, and *Spiophanes bombyx*. Cnidarians and bryozoans dominated the colonial fauna recorded. There were four EUNIS habitats recorded: Faunal communities of Atlantic circalittoral sand (EUNIS: MC521); Faunal communities of Atlantic circalittoral mixed sediment (EUNIS: MC421); *Echinocyamus pusillus, Ophelia borealis* and *Abra prismatica* in circalittoral fine sand (EUNIS: A5.251); and *Abra prismatica*, *Bathyporeia elegans* and polychaetes in circalittoral fine sand (EUNIS: A5.252). No Annex I habitats or species were identified.	(Ossian OWFL, 2024)
Seagreen 1 and Seagreen 1A OWFs (previously	27.87	19.88	Site-specific grab sampling, epibenthic beam trawls, and DDV surveys were conducted in April 2011. The sabellid polychaete biotopes 'dense Chone' and 'sparse Chone' dominated the central and eastern regions	(Seagreen Wind Energy Limited, 2012)

Project	Distance from the Array Area (km)	Distance to the Export Cable Corridor (km)	Overview of benthic communities recorded	Source
Seagreen Alpha and Bravo respectively when data were collected)			of Seagreen Alpha. *Sabellaria* sp., sparse polychaetes and bivalves, and faunal turf (SS.SMx.CMx.FluHyd) were present in the west. 'Dense Chone' and Polychaete-rich communities (SS.SMx.OMx.PoVen) were present in the eastern area of Seagreen Bravo; *Sabellaria* sp., rich polychaetes and bivalves, and epifauna with polychaetes were present in the west.	
Aberdeen OWF	38.60	34.71	A site-specific environmental survey was conducted in 2007. Two main biotopes were identified: circalittoral coarse sediment (SS.SCS.CCS) and circalittoral muddy sand (SS.SSa.CMuSa). The benthos was dominated by bivalves, polychaetes, and echinoderms such as *Ophiocten affinis* and *E. pusillus*.	(Aberdeen OWF Limited, 2010)
Hywind Scotland Pilot Park	44.43	54.73	Site-specific grab sampling and DDV were conducted in 2013. Fauna recorded were mainly associated with the biotope circalittoral fine sand (SS.SSa.CFiSa) and were characterised by sparse hermit crabs and brittlestars *Ophiura sp.*, as well as scattered anemones and hydroids. The main infaunal species were polychaetes, brittlestars and burrowing urchins. Occasional aggregations of *S. spinulosa* were recorded, however coverage was low, patchy, and small in extent.	(Statoil, 2015)
Berwick Bank OWF	46.53	47.70	Site-specific grab sampling, epibenthic beam trawls, and DDV surveys were conducted in 2020. Northern areas were dominated by *E. pusillus*, polychaete and bivalve communities and patches of super-abundant brittlestar *Amphiura filiformis*, Bivalves dominated the central and eastern areas and a patch in the west and Polychaete-rich deep Venus spp. communities were present in the west.	(SSE Renewables, 2022)
Inch Cape OWF	56.03	23.40	Site-specific grab sampling, epibenthic beam trawls, and DDV surveys were conducted in Spring 2012. Circalittoral sands and gravelly sands with areas of mixed sediments were recorded. Faunal assemblages were typical of these substrates, including dead man's fingers, *F. foliacea*, *Ophiothrix fragilis*, starfish *A. rubens*, *Hydrallmania falcata*, and *Spirobranchus triqueter*. The dominating biotype was *Kurtiella bidentata* and *Thyasira* spp. in circalittoral muddy mixed sediment (SS.SMx.CMx.KurThyMx) (65% of the	(Inch Cape Offshore Limited, 2018a, Inch Cape Offshore Limited, 2018b)

Project	Distance from the Array Area (km)	Distance to the Export Cable Corridor (km)	Overview of benthic communities recorded	Source
			area). Offshore circalittoral coarse sediment (SS.SCS.OCS) covered 31% and *Mediomastus fragilis*, *Lumbrineris* sp., with venerid bivalves in circalittoral coarse sand or gravel (SS.SCS.CCS.MedLumVen) covered 4%. Several *Sabellaria* sp., were reported, but no evidence of Annex I reefs was observed.	
Neart Na Gaoithe OWF	86.23	58.26	Site-specific grab sampling, epibenthic beam trawls, and DDV surveys were conducted in 2009. The offshore area was characterised by circalittoral sandy mud (SS.SMu.CSaMu), with species such as the seapen *Virgularia mirabilis*, *A. filiformis*, polychaetes *S. bombyx*, and bivalves *K. bidentata*, *Abra* spp., and *Ennucula tenuis*. The biotype *Amphiura filiformis* and *Ennucula tenuis* in circalittoral and offshore sandy mud (SS.SMu.CSaMu.AfilEten) and mosaics of SS.SCS.CCS and offshore circalittoral sand (SS.SSA.OSa) were also abundant. Soft polychaete and *Chaetopterus tubes*, megafauna burrows, and seapens were observed over soft sediments, while *O. fragilis*, dead man's fingers, and *Spirobranchus* spp., were observed over coarse mixed sediment.	(Mainstream Renewable Power, 2019)



Project Title: Bowdun Offshore Wind Farm

Figure Title: Other OWF Projects within the Regional Benthic Ecology Study Area

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

Data Sources: Client, CES, ABPmer

Service Layer Credits: World Topographic Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
World Topographic Map: Esri, HERE, Garmin, FAO, NOAA

VER	DATE	DETAILS	BY	CHK
00	16/10/24	First Issue	MJ	HM
01	25/06/25	Revision	MJ	HM
02	10/10/25	Revision	MJ	SW
03	10/03/26	Revision	MJ	HM

Drawing Number: EOR0770A-ES-BEN-T003-03

Figure 4.2: Other OWF Projects within the Regional Benthic Ecology Study Area

Local Benthic Ecology Study Area

4.1.6 Seabed habitat mapping was undertaken in the approaches of the Firth of Forth (Sotheran and Crawford-Avis, 2013), which lies in the south-east of the Regional Benthic Ecology Study Area. The following JNCC biotopes were recorded:

- kelp with cushion fauna and/or foliose red seaweeds (Foliose red seaweeds with dense *Dictyota dichotoma* and/or *Dictyopteris polypodioides* on exposed lower infralittoral rock (JNCC, 2022) (code: IR.HIR.KFaR.FoR.Dic) and *Laminaria hyperborea* and red seaweeds on exposed vertical rock (IR.HIR.KFaR.LhypRVt));
- mixed faunal turf communities on circalittoral rock (*Flustra foliacea* and colonial ascidians on tide-swept exposed circalittoral mixed substrata (CR.HCR.XFa.FluCoAs.X), *Flustra foliacea*, small solitary and colonial ascidians on tide-swept circalittoral bedrock or boulders (CR.HCR.Xfa.FluCoAs.SmAs) and *Flustra foliacea* and colonial ascidians on tide-swept moderately wave-exposed circalittoral rock (CR.HCR.Xfa.FluCoAs));
- circalittoral coarse sediment (*Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles (SS.SCS.CCS.SpiB));
- deep circalittoral coarse sediment (SS.SCS.OCS, SS.SCS.OCS(PoGintBy) and SS.SCS.OCS.(Sbom));
- circalittoral muddy sand (*Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSa.CMuSa.AalbNuc) and SS.SSa.CMuSa);
- SS.SSa.OSa/SS.SSa.OSa.(Sbom);
- circalittoral mixed sediments (*Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment (SS.SMx.CMx.OphMx), SS.SMx.CMx.FluHyd, SS.SMx.CMx.KurThyMx and *Sabellaria spinulosa* on stable circalittoral mixed sediment (SS.SBR.PoR.SspiMx));
- deep circalittoral mixed sediments (Polychaete-rich *Galathea* community with encrusting bryozoans and other epifauna on offshore circalittoral mixed sediment (SS.SMx.OMx.(PoGintBy));
- *Modiolus modiolus* beds on open coast circalittoral mixed sediment (SS.SBR.SMus.ModMx);
- *Alcyonium digitatum*, *Spirobranchus triqueter*, algal and bryozoan crusts on wave-exposed circalittoral rock (CR.MCR.EcCr.FaAlCr.Adig) and *Flustra foliacea* on slightly scoured silty circalittoral rock (CR.MCR.EcCr.FaAlCr.Flu); and
- seapens and burrowing megafauna in circalittoral fine mud (SS.Smu.CfiMu.SpnMeg) (Sotheran and Crawford-Avis, 2013).

Intertidal Benthic Communities

4.1.7 A Phase 1 intertidal walkover of the Benholm beach Landfall location was conducted in September 2023. Overall, there were two biotopes recorded in the strandline, six in the upper shore, eight in the mid shore, and seven in the lower shore, with two or three dominant biotopes per shore area (upper, mid and lower). The strandline predominantly consisted of talitrids on the upper shore and strandline (LS.LSa.St.Tal), which represented 95% of the biotopes sampled in the strandline. In the upper shore, *Fucus spiralis* on sheltered upper eulittoral rock (LR.LLR.F.Fspi) and *Ulva* spp. on freshwater-influenced and/or unstable upper eulittoral rock (LR.FLR.Eph.Ulv) were the dominant biotopes, accounting for approximately 58% and 33% of the upper shore biotopes, respectively. In the mid shore, the dominant biotope was *Fucus vesiculosus* on moderately exposed to sheltered mid eulittoral rock (LR.LLR.Fves) (60%), followed by LR.LLR.F.Fspi (approximately 18%). Finally, in the lower shore, the dominant biotopes were *Fucus serratus* on sheltered lower eulittoral rock (LF.LLR.F.Fserr) (approximately 31%), *Laminaria hyperborea* forest and foliose red seaweeds on moderately exposed upper infralittoral rock (IR.MIR.KR.Lhyp.Ft) (approximate 27%), and *Fucus serratus* on moderately exposed lower eulittoral rock (LR.MLR.BF.Fser) (approximately 17%).

4.1.8 The mosaic of biotopes and species recorded was typical of a sheltered to moderately sheltered rocky shore environment. Spiral wrack was most common in the upper shore, with a transition to serrated wrack *F. serratus* and bladder wrack *F. vesiculosus* in the mid shore, which persisted into the lower shore. Kelp *L. hyperborea* began to occur in the lower shore and marked the transition to the infralittoral zone. Fauna recorded were typical of a rocky shore, including the common rock barnacle *Semibalanus balanoides*, common periwinkle *Littorina littorea*, dog whelk *Nucella lapillus*, limpets *Patella* spp., and the beadlet anemone *Actinia equina*.

Designated Sites and Protected Features

4.1.9 There are five designated sites with benthic features within the Regional Benthic Ecology Study Area (JNCC, 2025). These include MPAs and Special Areas of Conservation (SACs) (Table 4.2).

Table 4.2: Designated Sites with Relevant Benthic Protected Features within the Regional Benthic Ecology Study Area

Designated Site	Distance from the Array Area (km)	Distance from the Export Cable Corridor (km)	Relevant Protected Benthic Features
Firth of Forth Banks Complex MPA	7.50	8.60	Ocean quahog *Arctica islandica* (listed as a Scottish PMF and on the Oslo-Paris Convention (OSPAR) List of Threatened and Declining Habitats and Species; Offshore subtidal sands and gravels (Scottish PMF); and Shelf banks and mounds (large scale feature).
Montrose Basin Ramsar	65.60	12.90	Estuary Mudflats
Southern Trench MPA	35.90	44.90	Burrowed mud habitat (Scottish PMF and on the OSPAR List of Threatened and Declining Habitats and Species).
Firth of Tay and Eden Estuary SAC	89.10	40.40	Annex I Estuaries; Annex I Mudflats and sandflats not covered by seawater at low tide; and Annex I Sandbanks which are covered by sea water at all times.
Isle of May SAC	104.50	67.10	Annex I Reefs

4.1.10 Data from the JNCC has been used to assess the presence of Annex I Reefs and Sandbanks within the Regional Benthic Ecology Study Area (JNCC, 2019, JNCC, 2021). As illustrated in Figure 4.3, the Array Area does not overlap with either of these sensitive Annex I habitats, but there is an overlap between the Export Cable Corridor and an area of Annex I rocky reef at the Landfall.

4.1.11 A review of the distribution of Scottish PMFs (Tyler-Walters *et al.*, 2016) reported that the following PMFs are known to occur within the Regional Benthic Ecology Study Area (but not the Local Benthic Ecology Study Area): blue mussel *Mytilus edulis* and *M. modiolus* beds, burrowed mud, sea pens and burrowing megafauna in circalittoral fine mud, intertidal mudflats, various PMF kelp habitats, ocean quahog aggregations, maerl or coarse shell gravel with burrowing sea cucumbers, seagrass beds, offshore subtidal sands and gravels, and offshore deep sea muds.

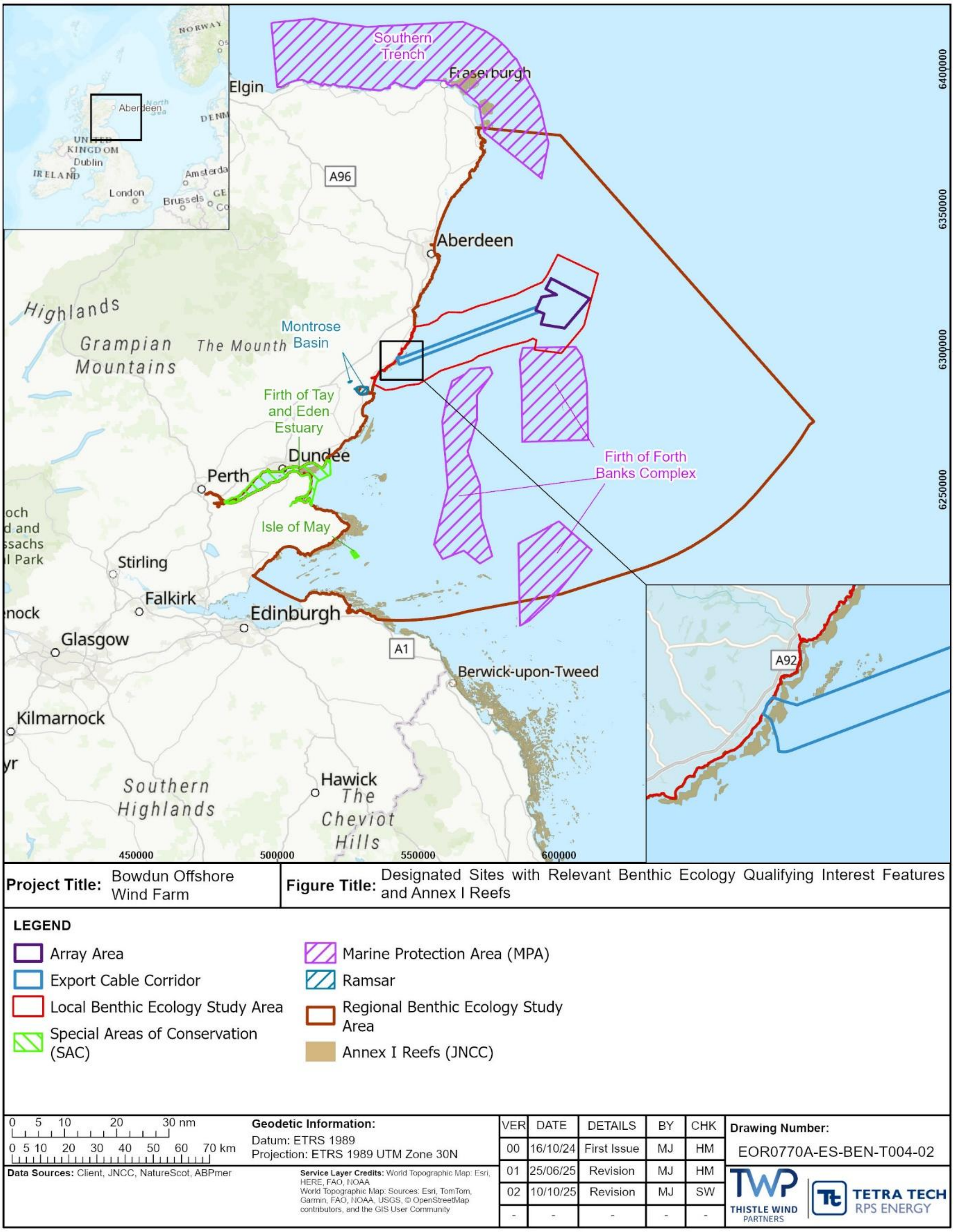
4.1.12 Within the Firth of Forth Banks Complex MPA, two broad faunal assemblages were identified (Pearce *et al.*, 2014). One faunal assemblage was aggregations of the polychaete *S. bombyx* in deep circalittoral sands and coarse sands. The second was mixed sands and gravels supporting a rich polychaete and epifaunal community (including the squat lobster *Galathea intermedia*). *S. spinulosa* reefs with sea squirt A*scidiella scabra* and squat lobster on gravelly sand were also present.

4.1.13 Another seabed survey within the Firth of Forth Banks Complex MPA recorded 12 biotopes with the most common being a SS.SSa.CMuSa biotope (Axelsson *et al.*, 2014). The muddy sand habitats recorded by this survey were dominated by the bivalves *A. alba* and *N. nitidosa*, with epifauna also including the brittlestar *Acrocnida brachiata* and sea star *Astropecten irregularis*. Brittlestars *O. fragilis* and *O. nigra*, *F. foliacea*, or *M. modiolus* typically dominated mixed sediment habitats. Finally, the dead man's fingers and ascidians were typically present in coarser sediments.

4.1.14 Dog whelk were recorded during the Phase 1 intertidal walkover survey. This species is included on the OSPAR List of Threatened and Declining Species (OSPAR Commission, 2008a).

4.1.15 The Montrose Basin is designated as a Ramsar site for estuaries and mudflats. The Scottish Environment Protection Agency (SEPA) conducted baseline seagrass surveys in the Montrose Basin, which is located 12.9 km southwards of the Export Cable Corridor Landfall and within the Regional Benthic Ecology Study Area (SEPA, 2018). These surveys found that the total area of seagrass coverage in 2013 was 1,747,000 m^2 with an average coverage of 41.8%. The surveys identified two species of seagrass, *Zostera noltei* and *Zostera angustifolia*. Seagrass beds are a PMF in Scotland as well as being a UK Biodiversity Action Plan habitat (Maddock, 2011, Tyler-Walters *et al.*, 2016).

4.1.16 The species *S. spinulosa* is a tube-dwelling polychaete which can form extensive biogenic reefs, which are listed as Annex I habitats and on the OSPAR List of Threatened and/or Declining Habitats. Individuals have been recorded within the Regional Benthic Ecology Study Area, however records of reefs are limited to the Solway Firth and the North Sea off Rattray Head (Pearce and Kimber, 2020) and the Firth of Forth Banks Complex MPA (Pearce *et al.*, 2014). There are very few extant records of reefs within Scotland, particularly in the North Sea. This is thought to be due to low sampling efforts to date and, thus, it is expected that more records of species and reefs will be made as the offshore industry progresses in the region (Pearce and Kimber, 2020). Individuals were recorded during site-specific surveys for the Seagreen 1 OWF, Berwick Bank OWF, Inch Cape OWF, and the Hywind Scotland Pilot Park, but no reefs were observed (Inch Cape Offshore Limited, 2018b, Seagreen Wind Energy Limited, 2012, SSE Renewables, 2022, Statoil, 2015).



Project Title: Bowdun Offshore Wind Farm

Figure Title: Designated Sites with Relevant Benthic Ecology Qualifying Interest Features and Annex I Reefs

LEGEND

- ☐ Array Area
- ☐ Export Cable Corridor
- ☐ Local Benthic Ecology Study Area
- ▨ Special Areas of Conservation (SAC)
- ▨ Marine Protection Area (MPA)
- ▨ Ramsar
- ☐ Regional Benthic Ecology Study Area
- ■ Annex I Reefs (JNCC)

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

Data Sources: Client, JNCC, NatureScot, ABPmer

Service Layer Credits: World Topographic Map: Esri, HERE, FAO, NOAA
World Topographic Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

VER	DATE	DETAILS	BY	CHK
00	16/10/24	First Issue	MJ	HM
01	25/06/25	Revision	MJ	HM
02	10/10/25	Revision	MJ	SW
-	-	-	-	-

Drawing Number: EOR0770A-ES-BEN-T004-02

Figure 4.3: Designated Sites with Relevant Benthic Ecology Qualifying Interest Features and Annex I Reefs

5 Baseline Characterisation – Site-specific surveys

5.1 Results – Subtidal ecology

Sediments

Geophysical Survey

5.1.1 Across the Local Benthic Ecology Study Area, seabed sediments were interpreted from SSS, MBES, SBP and UHRS data to be characterised by boulders close to shore and megaripples, smaller ripples and scattered boulders.

5.1.2 Within the Export Cable Corridor, the seabed was characterised by bedrock outcrops close to shore, stable sandy seabed out to 4.8 km from shore, an area of boulders out to 6.6 km, and megaripples, smaller ripples, and scattered boulders throughout the rest of the Local Benthic Ecology Study Area (G-Tec, 2024a).

5.1.3 Within the Array Area, the seabed was characterised by a complex morphology with variable elevation in depths below LAT of 54 m to 91 m, and sediments dominated by a mix of sand and silty sand, silty sand, and sand (G-Tec, 2024b). The sand comprised a large continuous unit with minimal slope variability in the north-east sector of the Array Area. The silty sand occurred across the northern, central and southern sectors, and was frequently associated with megaripples, which were mostly found in the north-east, north-west and centre of the Array Area. The centre and south of the Array Area was dominated by the mix of sand and silty sand. Sandwaves were present in the south central and eastern portion of the Array Area.

Sediment Characteristics

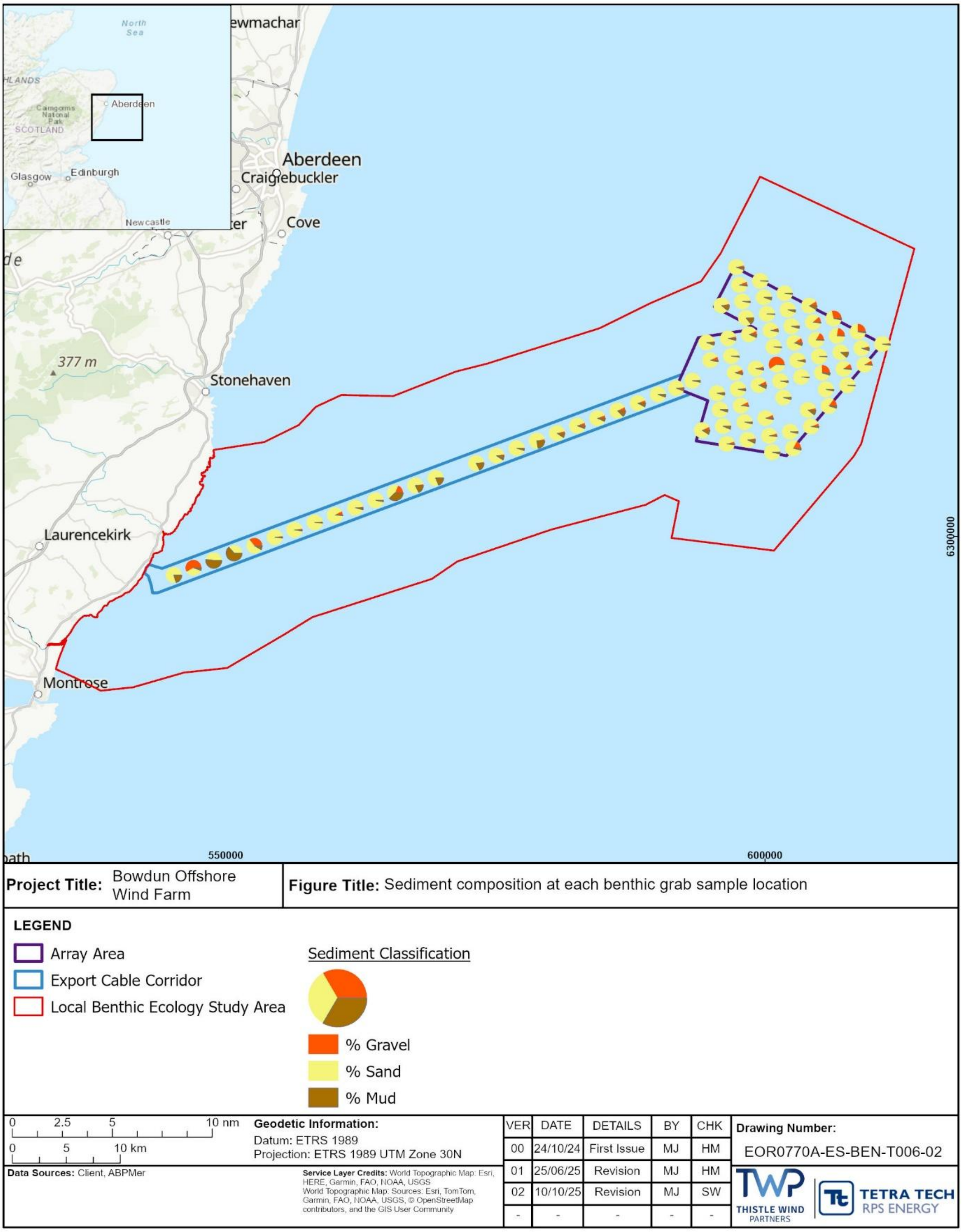
Particle Size Distribution

5.1.4 The percentage sediment composition (i.e. proportion of mud ≤0.63 mm; sand <2 mm; gravel ≥2 mm) at each station is shown in Figure 5.1. The sediment composition across the stations was composed on average of 6.43% gravel, 86.66% sand, and 6.91% mud. The majority of stations were classified as sand, with a small proportion of mud, and a single station, located in the centre of the Array Area, was composed of sandy gravel, with a Folk classification of very fine gravel (ENV059).

5.1.5 In general, coarser sediments were found in the west of the Local Benthic Ecology Study Area, along the Export Cable Corridor. Sediment classifications are shown in Figure 5.2. The majority (52.22%) of stations were classified as slightly gravelly sand or gravelly sand (27.78%), and these were located throughout both the Array Area and Export Cable Corridor. A small number of stations (10%) were classified as slightly gravelly muddy sand, located in the west of the Export Cable Corridor in the nearshore area, and two stations each were classified as gravelly muddy sand, muddy sandy gravel, and sand. The classifications of slightly gravelly sandy mud, muddy sand, sandy gravel, and sandy mud were recorded at one station each.

5.1.6 According to the Folk and Ward (1957) sorting coefficient, the majority of stations (54.44%) were poorly sorted and moderately sorted (30%), and these were located mostly within the Export Cable Corridor. An equal proportion of stations (7.78% each) were moderately well sorted and very poorly sorted, and these were located throughout both the Array Area and Export Cable Corridor.

5.1.7 Full PSA results are presented in Annex A.



Project Title: Bowdun Offshore Wind Farm

Figure Title: Sediment composition at each benthic grab sample location

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

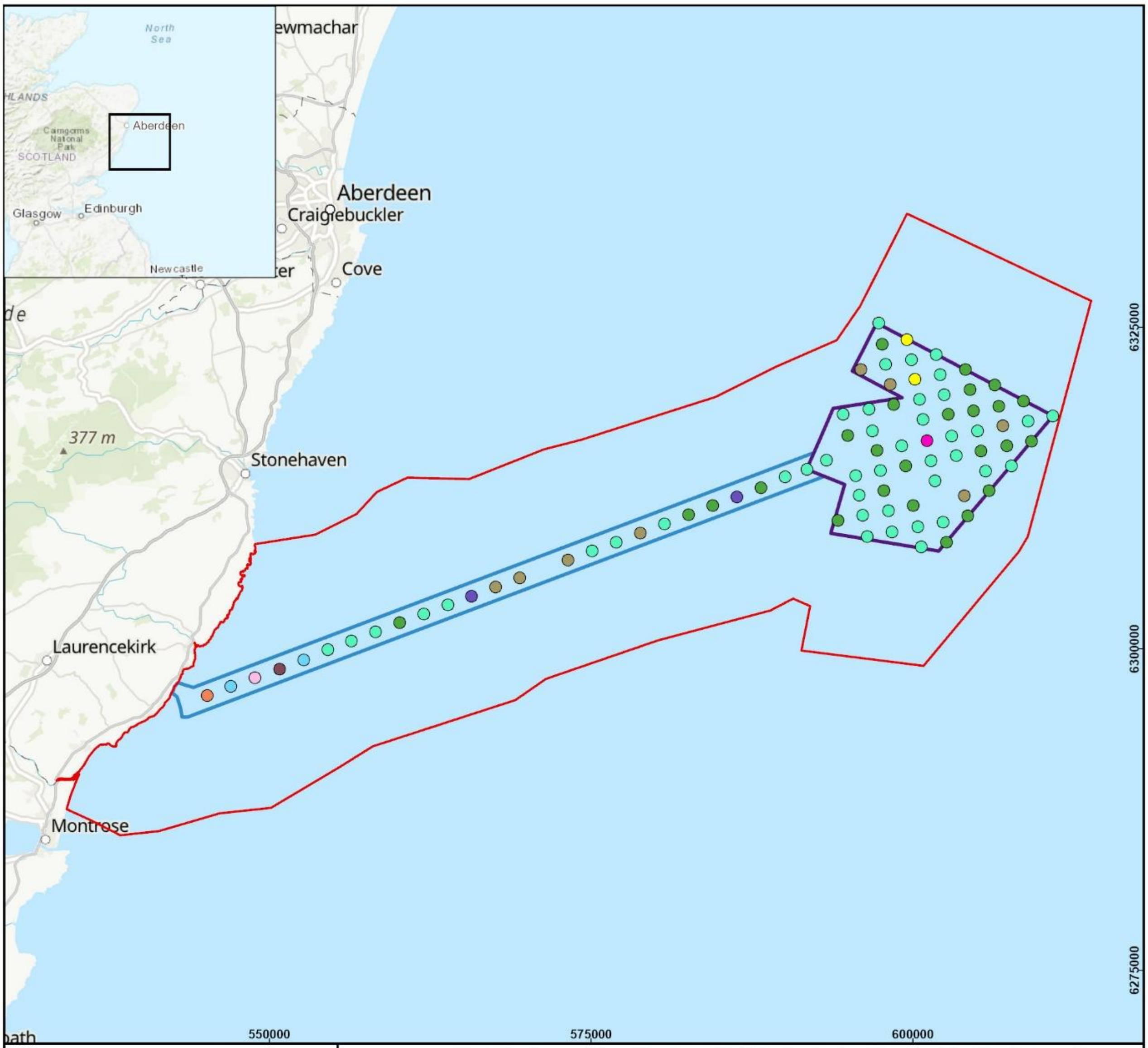
Data Sources: Client, ABPMer

Service Layer Credits: World Topographic Map: Esri, HERE, Garmin, FAO, NOAA, USGS
World Topographic Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

VER	DATE	DETAILS	BY	CHK
00	24/10/24	First Issue	MJ	HM
01	25/06/25	Revision	MJ	HM
02	10/10/25	Revision	MJ	SW
-	-	-	-	-

Drawing Number: EOR0770A-ES-BEN-T006-02

Figure 5.1: Sediment Composition (from PSA) at each Benthic Grab Sample Location



Project Title: Bowdun Offshore Wind Farm

Figure Title: Folk Sediment Classifications (British Geological Survey Modified) at each Benthic Grab Sample Location'

LEGEND

- ▭ Array Area
- ▭ Export Cable Corridor
- ▭ Local Benthic Ecology Study Area

Folk Sediment Classification (BGS modified)

- ● Sandy Mud
- ● Muddy Sand
- ● Slightly Gravelly Muddy Sand
- ● Gravelly Muddy Sand
- ● Sand
- ● Slightly Gravelly Sand
- ● Gravelly Sand
- ● Muddy Sandy Gravel
- ● Sandy Gravel
- ● Slightly Gravelly Sandy Mud

0 2.5 5 10 nm
0 5 10 km

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

Data Sources: Client,

Service Layer Credits: World Topographic Map: Esri, HERE, Garmin, FAO, NOAA, USGS
World Topographic Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

VER	DATE	DETAILS	BY	CHK
00	24/10/24	First Issue	MJ	HM
01	20/01/25	Revision	MJ	HM
02	25/06/25	Revision	MJ	HM
04	06/02/26	Revision	MJ	SW

Drawing Number: EOR0770A-ES-BEN-T007-04

Figure 5.2: Folk Sediment Classifications (British Geological Survey Modified) at each Benthic Grab Sample Location

Organic Content

5.1.8 TOM and TOC refer to the amount of organic matter preserved within the sediment. Levels of organic content can provide an indication of the influence of organic enrichment of the seabed sediment and the activity of primary producers (e.g. phytoplankton). The TOM and TOC levels recorded from the sediment samples collected from the 46 stations within the Local Benthic Study Area are presented in Annex B.

5.1.9 Of the 46 stations sampled, analysis of TOM by the loss on ignition process indicated that organic matter generally ranged from 0.8% at ENV029 and 2.6% at ENV003. One outlying station with a higher organic content proportion was recorded at ENV005 (12.5%). A result above the limit of detection was reported for all stations. The mean TOM for the Local Benthic Ecology Study Area was 1.6% (±1.66 Standard Deviation (SD)).

5.1.10 Analysis of TOC indicated that organic carbon generally ranged from 0.06% at ENV029, ENV039, ENV057, and ENV059 to 0.35% at station ENV019. A relatively high TOC was recorded at ENV005 (2.83%), which also represented the highest value for TOM. The mean TOC for the Local Benthic Ecology Study Area was 0.2% (±0.4% SD).

Sediment Contamination

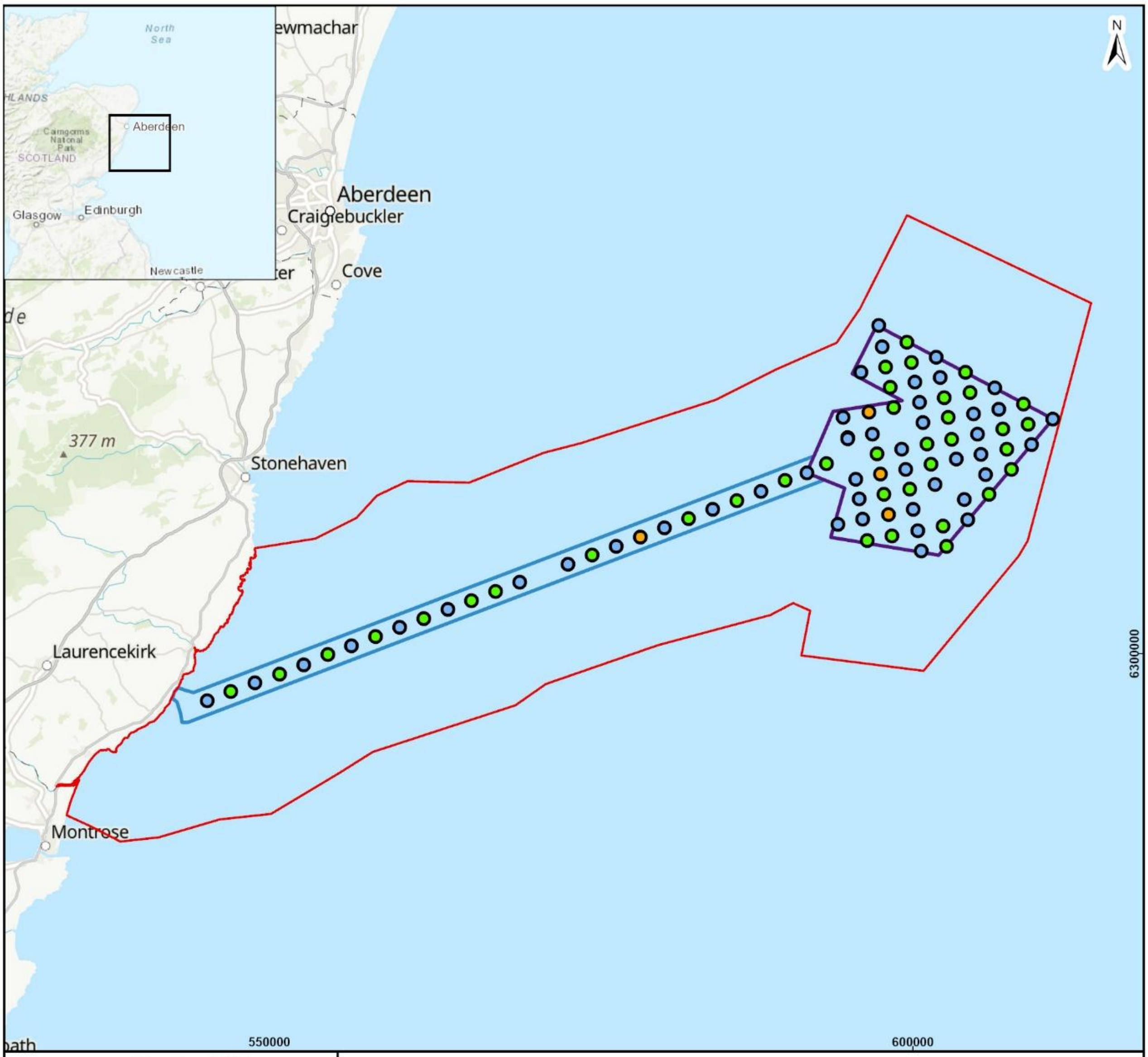
Metals

5.1.11 Metals primarily originating from anthropogenic activities tend to readily bind to subtidal finer sediments (Huang *et al.*, 2019, Silva *et al.*, 2024), which can lead to them accumulating to concentrations far higher than the surrounding environment (Cefas, 2005). These sediments can become re-suspended through bioturbation, physical processes or other disturbances, which can potentially release bound metals into the water column. The ingestion of sediments contaminated with heavy metals by marine organisms can lead to bioaccumulation through trophic levels, with this accumulation potentially causing adverse biological impacts due to these metal contaminants having a higher bioavailability compared to metal from geogenic sources (Huang *et al.*, 2019). Apex organisms which accumulate metals to adverse and toxic levels tend to experience significant adverse effects including mortality (Neff, 1997), impaired reproduction (McQuillan *et al.*, 2014, Neff, 2002), reduced growth, alterations in metabolism as a result of oxidative stress (McQuillan *et al.*, 2014) and disruption of the food chain.

5.1.12 The level of metals that were recorded in the sediment samples collected from the 46 stations within the Local Benthic Ecology Study Area are presented in Annex C, with stations exceeding the Marine Scotland and CSQG thresholds highlighted. The results showed that most stations have metal contamination levels below the relevant Marine Scotland AL1 and AL2, and CSQG TEL and PEL thresholds.

5.1.13 Specifically, results indicated that for all stations, levels of the following metals were below the Marine Scotland AL1 thresholds: mercury (0.25 mg/kg), cadmium (0.4 mg/kg), copper (30 mg/kg), nickel (30 mg/kg), lead (50 mg/kg), and zinc (130 mg/kg). All stations were also below the CSQG TEL thresholds for mercury (0.13 mg/kg), cadmium (0.7 mg/kg), copper (18.7 mg/kg), and zinc (124 mg/kg) (nickel is not measured for this threshold).

5.1.14 The Marine Scotland AL1 threshold for chromium (50 mg/kg) was exceeded at ENV005, and this station also exceeded the CSQG TEL thresholds for chromium (52.3 mg/kg) and lead (30.2 mg/kg). The Marine Scotland AL1 threshold for arsenic (20 mg/kg) was exceeded at three stations (ENV033, ENV039, and ENV025). The CSQG TEL threshold for arsenic (7.24 mg/kg) was exceeded at 41 stations (presented in Annex C and Figure 5.3).



Project Title: Bowdun Offshore Wind Farm

Figure Title: Stations at which arsenic exceeded CSQG TEL

LEGEND

- Array Area
- Export Cable Corridor
- Local Benthic Ecology Study Area

Exceeded CSQG TEL for arsenic?

- 🟢 Yes
- 🟠 No
- 🔵 Not sampled

0 2.5 5 10 nm
0 5 10 km

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

VER	DATE	DETAILS	BY	CHK
00	20/01/25	First Issue	MJ	HM
01	10/10/25	Revision	MJ	SW
-	-	-	-	-
-	-	-	-	-

Drawing Number: EOR0770A-BEN-T008-01

Data Sources: Client,

Service Layer Credits: World Topographic Map: Esri, HERE, Garmin, FAO, NOAA, USGS
World Topographic Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Figure 5.3: Sampling Stations at Which Arsenic Exceeded the CSQG TEL but was Below the CSQG PEL

Polychlorinated Biphenyls

5.1.15 PCBs are toxic to fish and other aquatic organisms (Burreau *et al.*, 2006). Reproductive and developmental problems have been observed in fish at low PCB concentrations, with the early life stages being most susceptible (Vuorinen *et al.*, 2002). There is growing evidence linking PCBs and similar compounds with reproductive and immuno-toxic effects in wildlife, including effect on seals and other marine mammals (Croll *et al.*, 2022). Due to their persistence and lipophilic nature, PCBs have the potential to bioaccumulate, particularly in lipid rich tissue such as fish liver. Bioaccumulation of PCBs is recorded in fish, birds and marine mammals with known sublethal toxicological effects (Madgett *et al.*, 2022). Accumulation of PCBs in sediment poses a potential hazard to sediment dwelling organisms.

5.1.16 Annex D presents the total of the International Council for the Exploration of the Sea (ICES)-7 PCBs (Marine Scotland, 2025) at stations that were recorded as being above the detection threshold of 0.08 µg/kg compared to the Marine Scotland AL1 (0.02 mg/kg) and AL2 (0.18 mg/kg), and the CSQG TEL (0.0215 mg/kg) and CSQG PEL (0.189 mg/kg).

5.1.17 At the three stations with detectable levels of PCBs (ENV03, ENV05, and ENV015), levels of total PCBs ranged from 0.00114 mg/kg to 0.00278 mg/kg. All concentrations were below Marine Scotland AL1 (0.02 mg/kg, and also did not exceed CSQG TEL (0.0215 mg/kg)

Organotins

5.1.18 Organotins are a large class of organometallic compounds which contain tin-carbon bonds. They are important environmental contaminants associated with agricultural, industrial and biomedical activities which were banned by the Internation Maritime Organisation due to toxicity effects (Okoro *et al.*, 2015). Organotins are toxic to marine organisms at very low concentrations. High concentrations can cause shell deformities in oysters and impair reproduction, with significant adverse impacts on cellular respiration leading to cell and organism death (Alzieu *et al.*, 1986).

5.1.19 Levels of organotins tributyltin were below the Marine Scotland ALs.

Polycyclic Aromatic Hydrocarbons

5.1.20 PAHs enter the environment through a variety of sources, including road run-off, sewage, atmospheric circulation and from historical industrial discharge. Once in the environment, PAHs have a strong affinity for organic carbon and as such sediment can act as a substantial sink (Meador *et al.*, 1995). Due to the high affinity for organic carbon, once ingested by fauna the PAHs cause oxidative stress and lead to adverse effects in the organism (Zahn *et al.*, 1981). Most species have a limited ability to metabolise PAHs and as a result they can bioaccumulate to toxic levels (Honda and Suzuki, 2020).

5.1.21 Results for all PAHs at all stations are presented in Annex E.

5.1.22 Concentrations of all PAHs at almost all stations across the Local Benthic Ecology Study Area were below their relevant CSQG TEL and CSQG PEL thresholds, and the ERL and ERM thresholds for all stations for all PAHs. Two stations exceeded the CSQG TEL thresholds, with both ENV003 and ENV005 exceeding for dibenzo[a,h]anthracene (6.22 µg/kg), and ENV005 also exceeding for acenaphthylene (5.87 µg/kg) and benzo[a]pyrene (88.8 µg/kg).

Total Hydrocarbon Content (THC)

5.1.23 THC concentrations varied across the Local Benthic Ecology Study Area, with the highest value of 94,120.21 µg/kg recorded for ENV05. The second highest concentration was 48,299.22 µg/kg (ENV03). These two stations may be outliers, with these stations also having the highest levels of TOC and being located very close to the coastline, as the third highest concentration being 6,501.83 µg/kg (ENV051). All stations were below the Marine Scotland AL1 of 100,000 µg/kg.

Infauna

Summary Statistics

5.1.24 A total of 449 taxa were recorded from the 90 infaunal grab samples collected across the Local Benthic Ecology Study Area. Of these, 47 were colonial taxa and 15 were taxa whose abundance was not enumerated due to processing protocols such as individual abundances being too high for counts as in the case of Nematoda, or because only fragments of individuals were found. These taxa were therefore only recorded as present and were removed from the numerical and statistical analyses, with the colonial taxa included in the epifaunal numerical analysis (as discussed in Section 3).

5.1.25 A total of 17,565 individuals, representing 379 enumerated taxa were recorded across the Local Benthic Ecology Study Area. Of these, juveniles accounted for 4,897 individuals from 52 taxa, representing 27.88% of the total number of individuals across 13.72% of the total number of enumerated taxa.

5.1.26 Of the 379 taxa enumerated throughout the Local Benthic Ecology Study Area, none were observed at all stations. A total of 97 taxa (25.59%) were recorded as single individuals and were distributed across the Local Benthic Ecology Study Area. A total of 268 taxa (70.71%) were represented by fewer than ten individuals from any one sample. Ecological communities that are frequently subjected to local disturbance or contamination events tend to be dominated by a limited number of tolerant taxa, which will be represented in high individual abundances (Clarke and Gorley, 2015). The high numbers of single and low abundance taxa suggest the Local Benthic Ecology Study Area is comprised of a reasonably diverse community that has been subjected to relatively limited disturbance or contamination.

5.1.27 Juveniles were recorded at stations across the Local Benthic Ecology Study Area from the major taxa Echinodermata, Annelida, Mollusca, Sipuncula, Cnidaria, Crustacea, Tunicata, Chelicerata, and Osteichthyes. The five most abundant juvenile taxa were within the Echinodermata (*Amphiuridae* sp. and *Ophiuridae* sp.), and the Annelida (*Opheliidae* sp., *L. cingulata*, and *Glycera* sp.). Juveniles of these five taxa comprised 75.62% of the total number of juvenile individuals. All five of the highest abundance juvenile taxa were recorded at the stations ENV015, ENV053, ENV059, ENV062, ENV065, ENV082 (located within the Export Cable Corridor and across the Array Area). No juvenile taxa were present at ENV011, which was the only station at which none of the five taxa with the highest abundance of juveniles were recorded. Station ENV069 recorded the highest number of juvenile taxa (16) with ENV033 recording the highest number of juvenile individuals (209). One juvenile and one adult of the ocean quahog were identified across two grab samples.

5.1.28 Initially, the enumerated dataset was divided into the five major taxonomic groups: Annelida (Polychaeta), Arthropoda, Mollusca, Echinodermata and "Other". The "Other" group was comprised of Chaetognatha, Chelicerata, Cnidaria, Hemichordata, Nemertea, Phoronida, Platyhelminthes, Priapulida, Protozoa, and Tunicata.

5.1.29 The absolute and proportional contributions of these five taxonomic groups to the overall community structure is summarised in Table 5.1 whilst biomass values by gross taxonomic groups are presented in Annex F1.

Table 5.1: Contribution of Gross Taxonomic Groups Recorded in the Infaunal Grab Samples

Phylum	Class	Abundance	Proportional contribution (%)	Number of taxa	Proportional contribution (%)
Annelida	Polychaeta	8,650	49.25	171	45.12
	Others	949	5.40	9	2.37
Arthropoda	Malacostraca	21	0.12	2	0.53
	Others/ Pycnogonida	1,712	9.75	92	24.27
Mollusca	Bivalvia	1,270	7.23	46	12.14
	Others	241	1.37	26	6.86
Echinodermata		3,961	22.55	16	4.22
Other		761	4.33	17	4.49
Total		17,565	100	379	100

5.1.30 The faunal communities were generally dominated by Annelida (n = 9,599), which contributed 54.65% of the total numbers of individuals, followed by Echinodermata (n = 3,961) which contributed 22.55% of the total number of individuals. Annelida were the most diverse group as well as the most abundant, accounting for 45.12% of the total number of taxa.

5.1.31 Annelida were dominated by Polychaeta (90.11%), with Oligochaeta and Sipuncula contributing 7.58% and 2.31%, respectively, of the total number of individuals within this taxon.

5.1.32 At individual stations, gross taxonomic group proportions broadly reflected these results, with Annelida comprising a mean of 51.63% of total individuals across all stations (ranging from 5.56% at ENV002 to 83.20% at ENV015, both within the Export Cable Corridor). Similarly, Echinodermata represented an average of 24.08% of the total individuals across all stations (ranging from 0% at ENV011, in the west of the Export Cable Corridor, to 61.43% at ENV057, in the east of the Array Area).

5.1.33 In terms of biomass, the data did not reflect the dominance of Annelida with respect to the number of individuals and number of taxa. Mollusca accounted for most of the mass recorded (92.56%) across all stations (with *Thracioidea* sp., *Asbjornsenia pygmaea*, and *Mytilidae* sp. being the three most abundant taxa), and Annelida accounted for the second highest biomass (3.66%) across all stations. At the station with the highest biomass (ENV032), Mollusca accounted for 99.8% of the biomass, due largely to the presence of relatively large numbers of *Mytilidae* sp. and *Caecum glabrum*. This may be as a result of Mollusca being able to grow to a larger body size than most Annelida and therefore are likely to have a higher weight per individual.

5.1.34 The most abundant taxon was juveniles of the Echinoderm *Amphiuridae* sp., with a total of 1,925 individuals recorded. These juvenile individuals were distributed at 80 stations throughout the Local Benthic Ecology Study Area. The highest number of individuals of this species occurred at ENV033 (in the east of the Array Area), with 104 individuals recorded.

5.1.35 The species with the second highest abundance was *E. pusillus*, with 1,590 individuals recorded. These individuals were widely distributed across the Local Benthic Ecology Study Area and were recorded at 83 stations. The highest abundance of *E. pusillus* occurred at station ENV053, with 60 individuals recorded.

5.1.36 The highest number of individuals at a single station was 679 individuals across 86 taxa at ENV024 (in the east of the Export Cable Corridor), which was also the highest number of taxa. The second highest number of taxa (85) was recorded at ENV036 (in the east of the Array Area). The lowest number of taxa was two at ENV011 (in the west of the Export Cable Corridor), with this station also having the lowest number of individuals (two).

Multivariate Community Analysis

5.1.37 The results of the hierarchical CLUSTER analysis of the square root transformed infaunal dataset, together with the SIMPROF test, identified 24 faunal groups that were statistically dissimilar (Figure 5.4). Of these faunal groups, six contained only a single station.

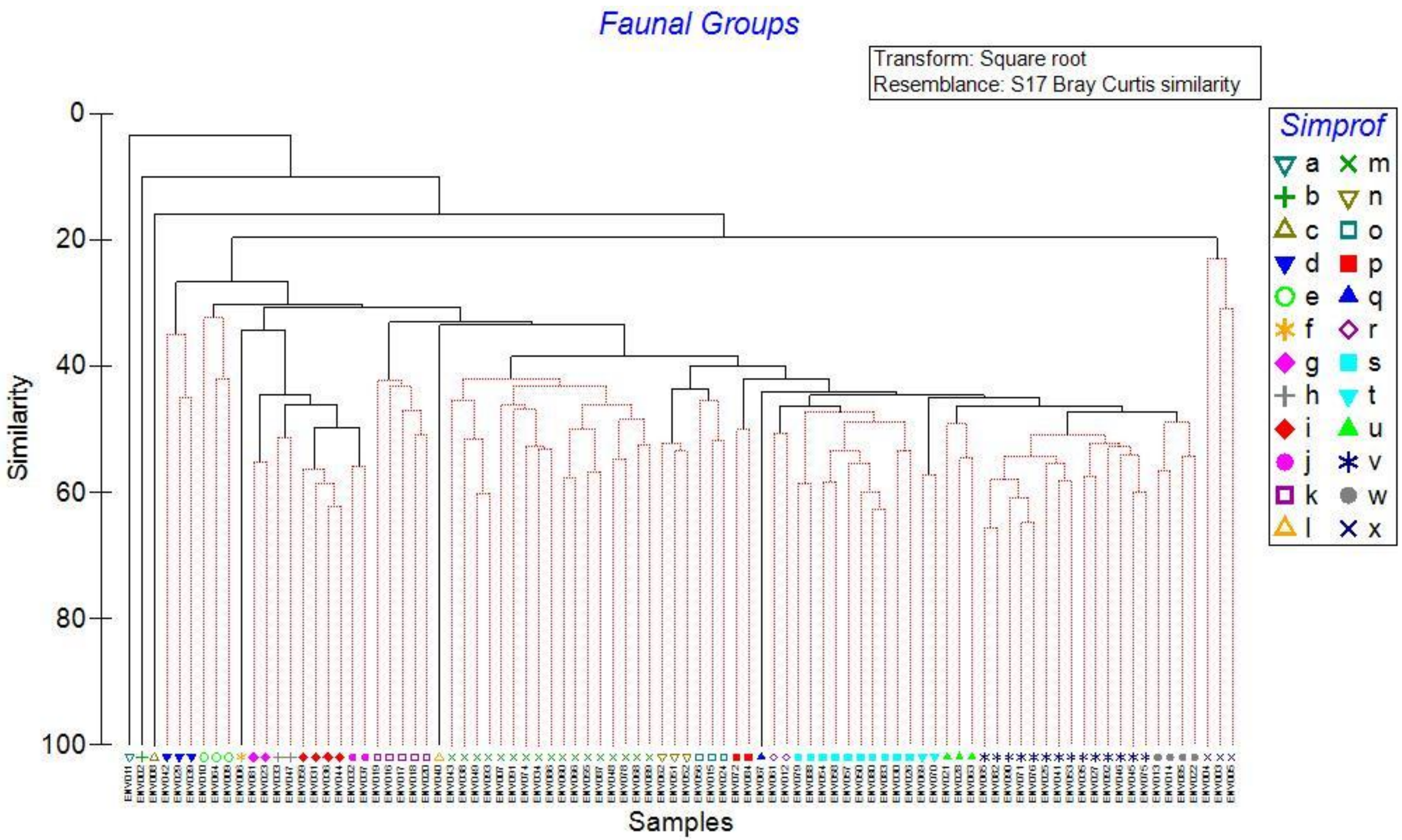


Figure 5.4: Dendrogram of SIMPROF Faunal Groups from Benthic Subtidal Grab Samples

5.1.38 Of the identified faunal groups, groups A (ENV011), B (ENV002), C (ENV008), D (ENV029, ENV039, and ENV042, located across the Array Area), E (ENV009 and ENV010, located within the west of the Export Cable Corridor), F (ENV006), L (ENV040) and X (ENV003, ENV004, ENV005) were dissimilar from the other faunal groups as shown in the two-dimensional multi-dimensional scaling plot (Figure 5.5). Of the six of the faunal groups which comprised single stations (Faunal Groups A, B, C, F, L, and Q (ENV040, within the north of the Array Area)), all faunal groups except Q presented beyond the main cluster. The stress value for the multi-dimensional scaling plot (0.17) indicates that this is a potentially useful representation of the data but should be treated with caution (Clarke and Gorley, 2015). The three-dimensional multi-dimensional scaling plot has not been presented, despite a lower stress value of 0.13, as the two-dimensional multi-dimensional scaling plot presents a clearer visual presentation of the data.

5.1.39 Most stations, in faunal groups C, D, E, G, H, I, J, L, M, N, O, P, Q, R, S, T, U, V, and W, located across the east of the Export Cable Corridor and throughout the Array Area, were associated with a range of sandy and slightly gravelly sediments. These stations were typically dominated by *E. pusillus* and *O. borealis*, with polychaetes including *Glycera lapidum* and *Parexogone hebes*. These faunal groups were classified as *Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in circalittoral fine sand (SS.SSa.CFiSa.EpusOborApri).

5.1.40 The faunal group X (ENV003, ENV004, and ENV005, all near to the Landfall within the Export Cable Corridor) was associated with sediment types ranging from muddy sand gravel to sandy mud, and was characterised by *Amphiuridae* sp., *Pholoe baltica*, *L. cingulata*, and *Eudorella truncatula*. This faunal group did not align well with any lower level biotope, and thus was classified at a higher level as circalittoral muddy sand (SS.SSa.CMuSa).

5.1.41 The faunal group A (ENV011, within the middle of the Export Cable Corridor) was associated with slightly gravelly sand, and was characterised by very low abundances of *Aurospio banyulensis* and *Copepoda* sp. Due to the lack of characterising infaunal species, this station was classified as the higher level biotope offshore circalittoral sand (SS.SSa.OSa).

5.1.42 The faunal group B (ENV002, near to the Landfall within the Export Cable Corridor) was associated with muddy sand sediment, and was characterised by *N. nitidosa* and *Nuculidae* sp. This single station broadly aligned with the biotope *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSa.CMuSa.AalbNuc).

5.1.43 The faunal group F (ENV006, within the west of the Export Cable Corridor) was associated with muddy sandy gravel, and was characterised by *L. cingulata*, *M. fragilis*, *G. lapidum*, and *Embletonia pulchra*. This station was classified as *Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel (SS.SCS.CCS.MedLumVen).

5.1.44 The results of the CULSTER analysis, SIMPROF tests and SIMPER analyses were used, together with the raw untransformed infaunal data, to assign infaunal biotopes to each station. In several instances, clusters that were identified as significantly different from each other in SIMPROF tests were assigned the same biotope code. This was based on a review of the SIMPER results, which indicated that the differences between the groups could be explained by differences in abundances of characterising species rather than the presence or absence of key species. The full list of biotopes with additional detail is presented in Table 5.2. The benthic communities present were characterised by a total of five infaunal biotopes, of which three have been classified to the lowest possible level. The extents of these biotopes have been extrapolated to the extents of the site-specific geophysical data within the Export Cable Corridor and Array Area. The distribution of the biotopes is shown in Figure 5.6.

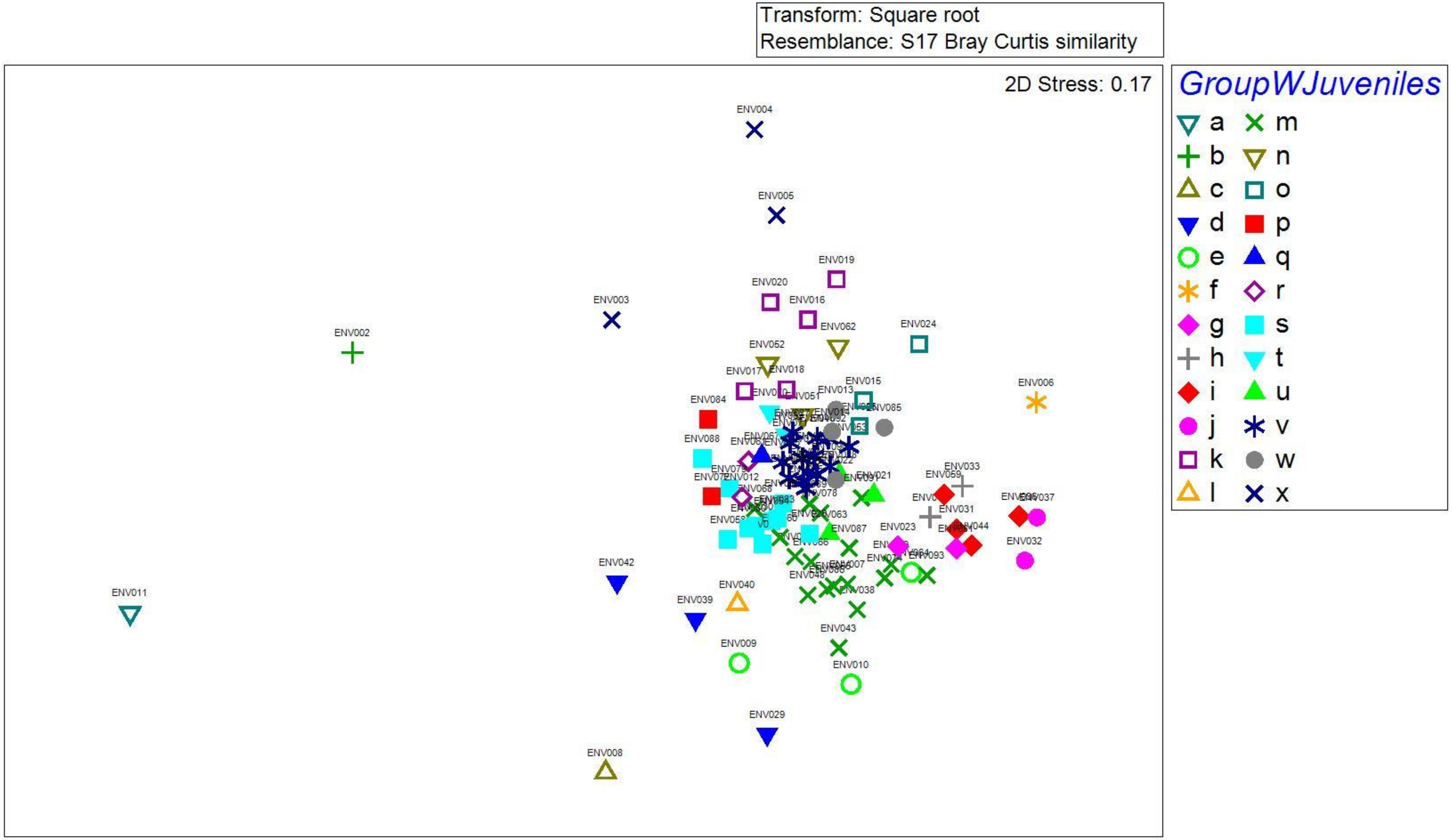
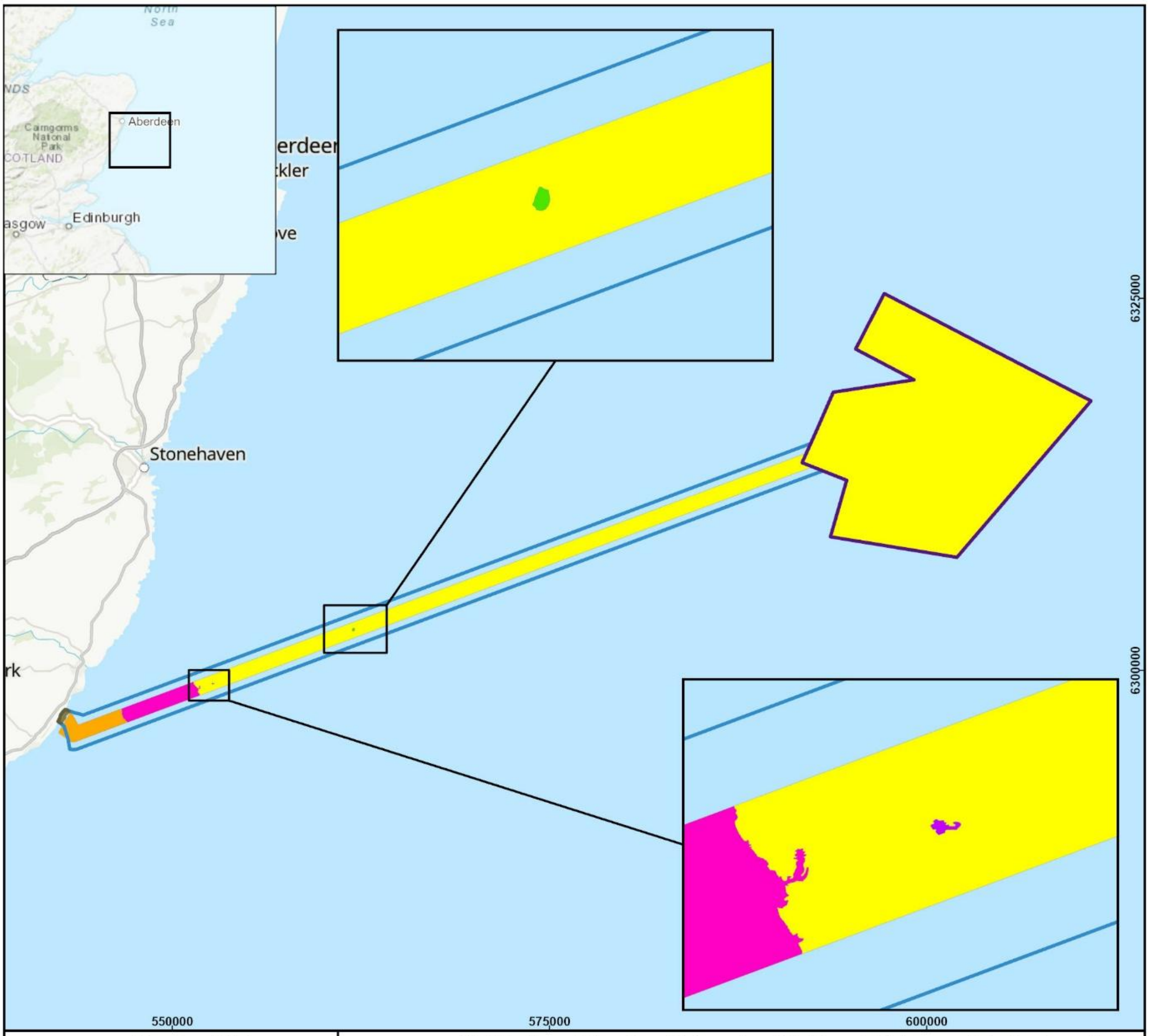


Figure 5.5: Two-Dimensional Multi-Dimensional Scaling Plot of Faunal Groups from Benthic Subtidal Grab Samples

Table 5.2: Infaunal Biotopes Identified from Grab Samples within the Local Benthic Ecology Study Area

Preliminary Infaunal Biotope	Grab Sample Stations	Water Depth Range (m below LAT)	Sediment Classification (BSH)	Characterising Species	Geographic Location
SS.SSa.CFiSa.EpusOborApri *Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in circalittoral fine sand	ENV007, ENV008, ENV009, ENV010, ENV012, ENV013, ENV014, ENV015, ENV021, ENV022, ENV023, ENV024, ENV025, ENV026, ENV027, ENV028, ENV029, ENV030, ENV031, ENV032, ENV033, ENV034, ENV035, ENV036, ENV037, ENV038, ENV039, ENV040, ENV041, ENV042, ENV043, ENV044, ENV045, ENV046, ENV047, ENV048, ENV049, ENV050, ENV051, ENV052, ENV053, ENV054, ENV055, ENV056, ENV057, ENV058, ENV059, ENV060, ENV061, ENV062, ENV063, ENV064, ENV065, ENV066, ENV067, ENV068, ENV069, ENV070, ENV071, ENV072, ENV074, ENV075, ENV076, ENV078, ENV079, ENV080, ENV081, ENV082,	43-97	Sand, Slightly Gravelly Muddy Sand, Gravelly Muddy Sand, Slightly Gravelly Sand, Gravelly Sand, Sandy Gravel	*E. pusillus*, *O. borealis*, *Amphiuridae* sp., *Copepoda* sp., *Nemertea* sp., *L. cingulata*, *Glycera* sp., *G. lapidum*, *P. hebes*, *P. baltica*	Across full Array Area and Export Cable Corridor

Preliminary Infaunal Biotope	Grab Sample Stations	Water Depth Range (m below LAT)	Sediment Classification (BSH)	Characterising Species	Geographic Location
	ENV083, ENV084, ENV085, ENV086, ENV087, ENV088, ENV089, ENV090, ENV091, ENV092, ENV093,				
SS.SSa.CMuSa Circalittoral muddy sand	ENV003, ENV004, ENV005	33-51	Muddy Sandy Gravel, Slightly Gravelly Muddy Sand, Sandy Mud	Amphiuridae (Juveniles), *P. baltica, L. cingulata, E. truncatula*	Near Landfall in Export Cable Corridor
SS.SSa.CMuSa.AalbNuc *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment	ENV002	30	Muddy Sand	*N. nitidosa*, Nuculidae (Juveniles)	Near Landfall in Export Cable Corridor
SS.SCS.CCS.MedLumVen *Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel	ENV006	45	Muddy Sandy Gravel	*L. cingulata, M. fragilis, G. lapidum, E. pulchra*	West within Export Cable Corridor
SS.SSa.OSa Offshore circalittoral sand	ENV011	56	Slightly Gravelly Sand	*A. banyulensis*, Copepoda	Middle of Export Cable Corridor



Project Title: Bowdun Offshore Wind Farm

Figure Title: Distribution of Combined Infaunal and Epifaunal Biotopes within the Array Area and Export Cable Corridor

LEGEND

☐ Array Area
☐ Export Cable Corridor
🟫 Intertidal Area

Biotope within Geophysical Data Coverage Area

🟪 SS.SCS.CCS.MedLumVen
🟨 SS.SSa.CFiSa.EpusOborApri
■ SS.SSa.CMuSa
🟧 SS.SSa.CMuSa.AalbNuc
🟩 SS.SSa.OSa

0 2.5 5 nm
0 5 10 km

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

Data Sources: Client,

Service Layer Credits: World Topographic Map: Esri, HERE, Garmin, FAO, NOAA, USGS
World Topographic Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

VER	DATE	DETAILS	BY	CHK
00	23/06/25	First Issue	MJ	HM
01	25/06/25	Revision	MJ	HM
02	10/10/25	Revision	MJ	SW
-	-	-	-	-

Drawing Number:
EOR0770A-ES-BEN-T009-02

Figure 5.6: Distribution of Combined Infaunal and Epifaunal Biotopes Within the Array Area and Export Cable Corridor

Univariate Statistics

5.1.45 The following univariate statistics were calculated for each station: number of species (S), abundance (N), biomass in grams (g), Margalef's index of Richness (d), Pielou's Evenness index (J'), Shannon-Wiener Diversity index (H') and Simpson's index of Dominance (λ). The mean of each of these indices was then calculated for each of the biotopes identified from the infaunal data, and these are summarised in Table 5.3, with univariate statistics for individual sites presented in Annex F3.

Table 5.3: Mean (± SD) Univariate Statistics for the Preliminary Infaunal Benthic Biotopes

Biotope	S	N	Biomass (g)	d	J’	H’	λ
SS.SSa.CFiSa.EpusOborApri	44.93 (±14.76)	78.35 (±32.97)	10.90	10.04 (±2.47)	0.96 (±0.01)	3.60 (±0.32)	0.98 (±0.01)
SS.SSa.CMuSa	28 (±4.97)	58 (±20.05)	3.13	6.71 (±0.68)	0.94 (±0.01)	3.10 (±0.13)	0.96 (±0.004)
SS.SSa.CMuSa.AalbNuc	11	20	0.16	3.34	0.93	2.22	0.91
SS.SCS.CCS.MedLumVen	59	97	0.72	12.67	0.95	3.86	0.98
SS.SSa.OSa	2	2	0.003	1.44	1	0.69	1

5.1.46 The univariate statistics indicate that the SS.SSa.CFiSa.EpusOborApri biotope had the highest mean number of taxa (44.93 ± 14.76). The SS.SSa.CFiSa.EpusOborApri biotope also had the highest mean number of individuals (78.35 ± 32.97). The biotope with the lowest number of individuals was SS.SSa.OSa biotope (two, with no SD due to being comprised of only one station), which also had the lowest mean number of taxa (two).

5.1.47 The SS.SCS.CCS.MedLumVen biotope had the highest diversity indices (d=12.67, H'=3.86), although this was only a single station. The biotope SS.SSa.CFiSa.EpusOborApri had the second highest diversity indices (d=10.04 SD 2.47, H’=3.60 SD 0.32). The other biotopes were lower for these metrics, with the single station representing the SS.SSa.OSa biotope having the lowest diversity indices (d=1.44, H’=0.69).

5.1.48 Pielou's evenness scores (J') and the Simpson's index of Dominance (λ) scores were similar across the biotopes, with values of J' between 0.93 and 1, indicating an even distribution of abundances among taxa and that the biotopes were typically not dominated by a high number of individuals within a small number of species. Values for λ showed a similarly small range across all biotopes (0.91-1), which indicates that all the biotopes are represented by a relatively wide diversity of species (with the exception of SS.SSa.OSa, which was only represented by two species).

5.1.49 Figure 5.7 to Figure 5.9 show the mean number of taxa, individuals, abundance and biomass for each of the major faunal groups (i.e. Annelida, Arthropoda, Mollusca, Echinodermata and Other) in each of the biotopes identified within the Local Benthic Ecology Study Area, from the benthic infaunal grabs.

5.1.50 As shown in Figure 5.7, the proportions of the number of taxa were similar for Arthropoda, Mollusca, Echinodermata and Other across SS.SSa.CFiSa.EpusOborApri, SS.SSa.CMuSa, and SS.SCS.CCS.MedLumVen, with SS.SSa.CMuSa.AalbNuc matching this distribution for Arthropoda, Mollusca, and Echinodermata, but not having any species in the Other category. SS.SSa.OSa was comprised of only two taxa, with one specimen each of Echinodermata and Annelida. The main difference in proportions between biotopes was caused by differences in Annelida numbers, which was the largest single taxa group in the SS.SSa.CFiSa.EpusOborApri, SS.SSa.CMuSa, and SS.SSa.CMuSa.AalbNuc biotopes.

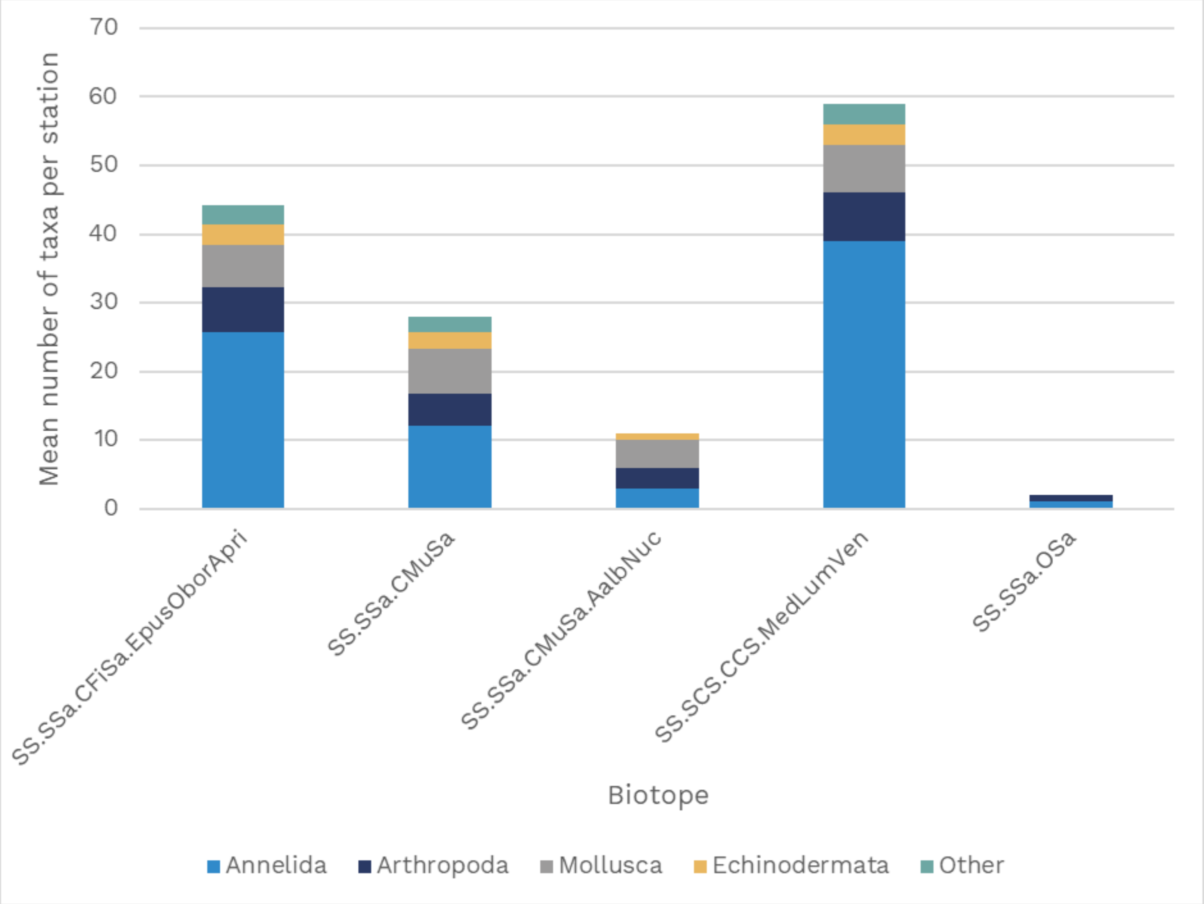


Figure 5.7: Mean Number of Taxa per Taxonomic Group for each Infaunal Biotope

5.1.51 The distribution of numbers of individuals across the taxonomic groups within each biotope is shown in Figure 5.8. The results indicated the presence of high numbers of Annelida in the SS.SSa.CFiSa.EpusOborApri, SS.SSa.CMuSa, and SS.SCS.CCS.MedLumVen biotopes, with Mollusca as the most abundant group in SS.SSa.CMuSa.AalbNuc, and the second most abundant in all other biotopes except SS.SSa.OSa.

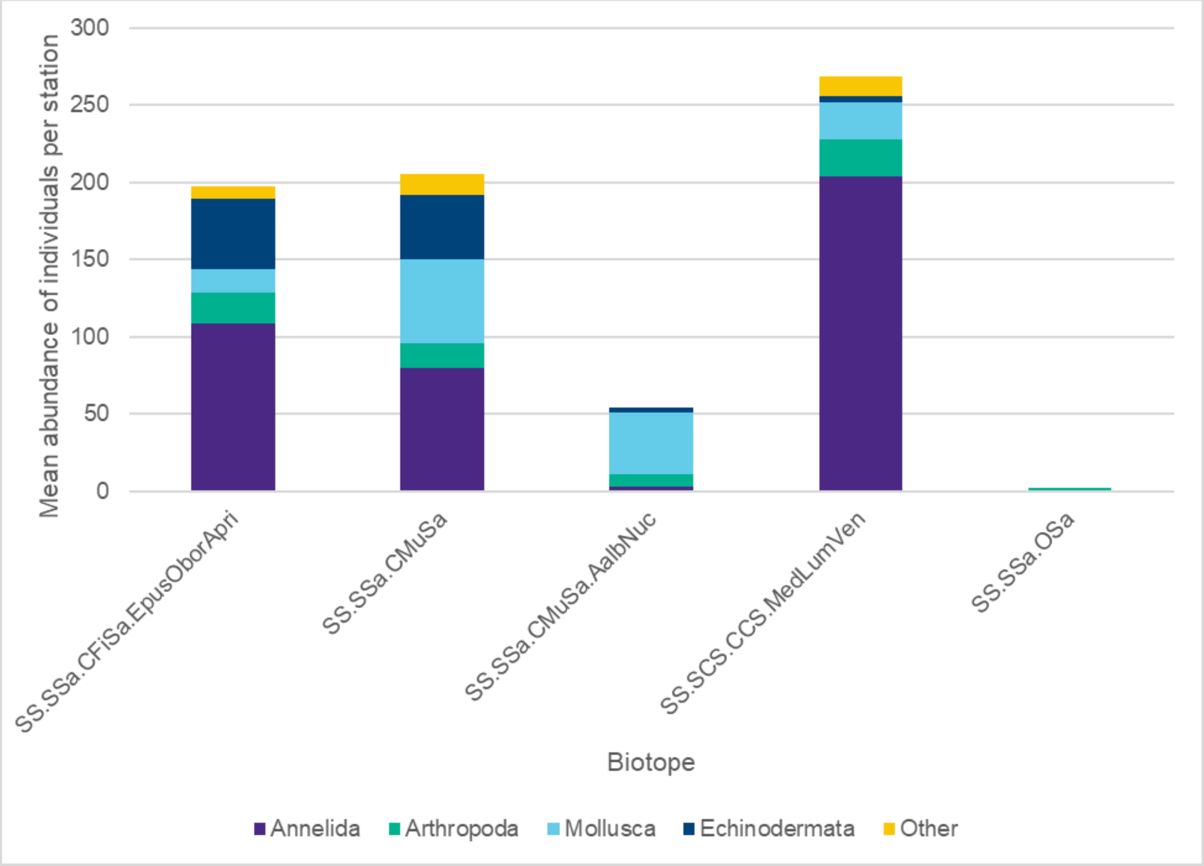


Figure 5.8: Mean Abundance of Individuals per Taxonomic Group for Each Infaunal Biotope

5.1.52 The mean biomass is shown in Figure 5.9. Biomass was dominated by Mollusca for the biotopes SS.SSa.CFiSa.EpusOborApri and SS.SSa.CMuSa.AalbNuc, Echinodermata for SS.SSa.CMuSa, and Annelida for SS.SCS.CCS.MedLumVen. The relatively high biomass value in SS.SSa.CFiSa.EpusOborApri was due to the weight of larger individual species, as the pattern was not reflected in the mean abundance of Mollusca and Echinodermata taxa or individuals for other biotopes. Annelida made up a small proportion of the total biomass in most biotopes, which is expected due to the small size of most Annelida species.

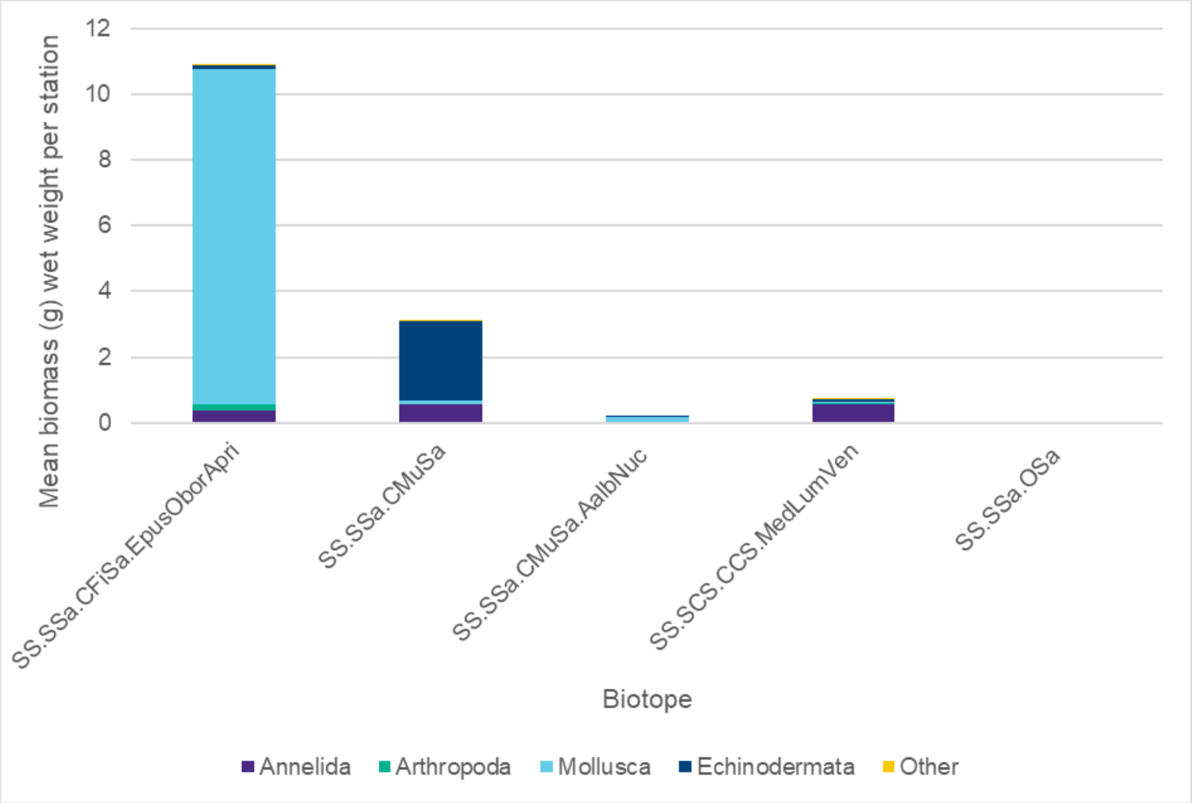


Figure 5.9: Mean Biomass per Taxonomic Group for Each Infaunal Biotope

5.1.53 The eDNA results indicated the presence of 21 additional species across six phyla, including Arthropoda, Annelida, Mollusca, Echinodermata, Cnidaria, and Bryozoa. No invasive species or International Union for Conservation of Nature red list species were recorded within the eDNA results. The eDNA results did not reveal any additional trends in diversity compared to the traditional morphological analysis. Results are presented in Annex I.

Epifauna

Seabed Imagery

5.1.54 The sediments recorded in the seabed imagery largely comprised of offshore circalittoral sand and a complex of offshore circalittoral mixed sediment and circalittoral mixed sediment (Figure 5.10). Relatively few epifaunal species were recorded, with visible species typically dominated by hydrozoans, bryozoans, and cnidarians. The most abundant taxon present was the hydroid *Merona cornucopiae*, followed by *F. foliacea* (Figure 5.11), *Folliculinidae* sp., and hermit crabs *Paguridae* sp. The images in Figure 5.10 and Figure 5.11 were chosen as being broadly representative of the seabed type and fauna present across the survey area; most other images comprised largely featureless gravelly, sandy, and muddy habitats. The DDV footage broadly indicated the presence of the same species with the same distribution as the epifaunal component of the infaunal grab samples.

Figure 5.10 Complex of Offshore Circalittoral Mixed Sediment and Circalittoral Mixed Sediment at ENV028

Figure 5.11: *Merona cornucopiae* and *Flustra foliacea* at ENV070

Summary Statistics

5.1.55 The epifaunal data that were recorded as present/absent, and therefore removed from the infaunal grab data analysis, were combined with the epifaunal data from the DDV. From this new dataset, fragments, burrows, nematodes, eggs, worm casts, fish, and non-identifiable biota were removed. In the remaining epifaunal dataset, a total of 71 taxa were recorded from the 93 epifauna and DDV samples during the site-specific benthic subtidal survey. Of the 71 taxa, *M. cornucopiae* and *F. foliacea* were recorded across the greatest number of stations, from 22 and 21 stations, respectively. A total of 47 taxa occurred at fewer than three stations. Station ENV031, located in the north of the Array Area, recorded the highest number of epifaunal taxa (11 taxa).

Multivariate Community Analysis

5.1.56 The results of the CLUSTER analysis, SIMPROF test and SIMPER analysis were used, together with the raw untransformed data, to assign biotopes to stations based on the combined DDV data and the adjusted epifaunal component of the grab sample Table 5.4. Full results of the multivariate analysis are presented in Annex G1.

5.1.57 The results of the hierarchical CLUSTER analysis of the square root transformed epifaunal dataset, together with the SIMPROF test, identified two faunal groups (Figure 5.12) that were statistically dissimilar. The two-dimensional multi-dimensional scaling plot is shown in Figure 5.13, and the stress value of 0.01 indicates that this is a good representation of the data. The three-dimensional multi-dimensional scaling plot has not been presented as the two-dimensional multi-dimensional scaling plot presents a clearer representation of the data.

5.1.58 The characterising species within the faunal groups did not directly match the descriptions of any specific biotopes. Therefore, two biotopes were classified based on the sediment type of the majority of stations within cluster groups (Table 5.4).

5.1.59 Faunal group A was associated with almost no fauna and was characterised by a range of sand types, with this therefore classified as SS.SSa.OSa. This group covered some of the west of the Export Cable Corridor, and throughout the Array Area, within the west and north of the Local Benthic Ecology Study Area.

5.1.60 Faunal group B was associated with *M. cornucopiae*, *F. foliacea*, *Folliculinidae* sp., *Paguridae* sp., and Porifera, and was characterised by sediments ranging from mud to gravel, with this group therefore classified as a complex of circalittoral mixed sediment (SS.SMx.CMx) and offshore circalittoral mixed sediment (SS.SMx.OMx). These stations were widely distributed across the Export Cable Corridor and Array Area.

Table 5.4: Preliminary Epifaunal Biotopes Identified from the Epifaunal Dataset Within the Benthic Ecology Study Area

Preliminary Infaunal Biotope	Grab Sample Station	Water Depth Range (m below LAT)	Sediment Classification (BSH)	Characterising Species	Geographic Location
SS.SSa.OSa Offshore circalittoral sand	ENV002, ENV011, ENV029, ENV038, ENV042, ENV054, ENV072, ENV079, ENV083, ENV087	27-63	Muddy Sand, Sand, Slightly Gravelly Sand, Gravelly Sand	*Lovenella clausa*	Within west of Export Cable Corridor and across Array Area
SS.SMx.CMx Circalittoral mixed sediment and/or SS.SMx.OMx Offshore circalittoral mixed sediment	ENV003, ENV004, ENV005, ENV006, ENV007, ENV008, ENV009, ENV010, ENV012, ENV013, ENV014, ENV015, ENV016, ENV017, ENV018, ENV019, ENV020, ENV021, ENV022, ENV023, ENV024, ENV025, ENV026, ENV027, ENV028, ENV030, ENV031, ENV032, ENV033, ENV034, ENV035, ENV036, ENV037, ENV039, ENV040, ENV041, ENV043, ENV044, ENV045, ENV046, ENV047, ENV048, ENV050, ENV051, ENV052, ENV053, ENV055, ENV056, ENV057, ENV058, ENV059, ENV060, ENV061, ENV062, ENV063, ENV064,	33-101	Slightly Gravelly Sandy Mud, Sandy Mud, Slightly Gravelly Sand, Gravelly Sand, Slightly Gravelly Muddy Sand, Muddy Sandy Gravel	*M. cornucopiae, F. foliacea*, Folliculinidae, *Paguridae* sp., Porifera	Within Export Cable Corridor and Across Array Area

Preliminary Infaunal Biotope	Grab Sample Station	Water Depth Range (m below LAT)	Sediment Classification (BSH)	Characterising Species	Geographic Location
	ENV065, ENV066, ENV067, ENV068, ENV069, ENV070, ENV071, ENV074, ENV075, ENV076, ENV078, ENV080, ENV081, ENV082, ENV084, ENV085, ENV086, ENV088, ENV089, ENV090, ENV091, ENV092, ENV093				

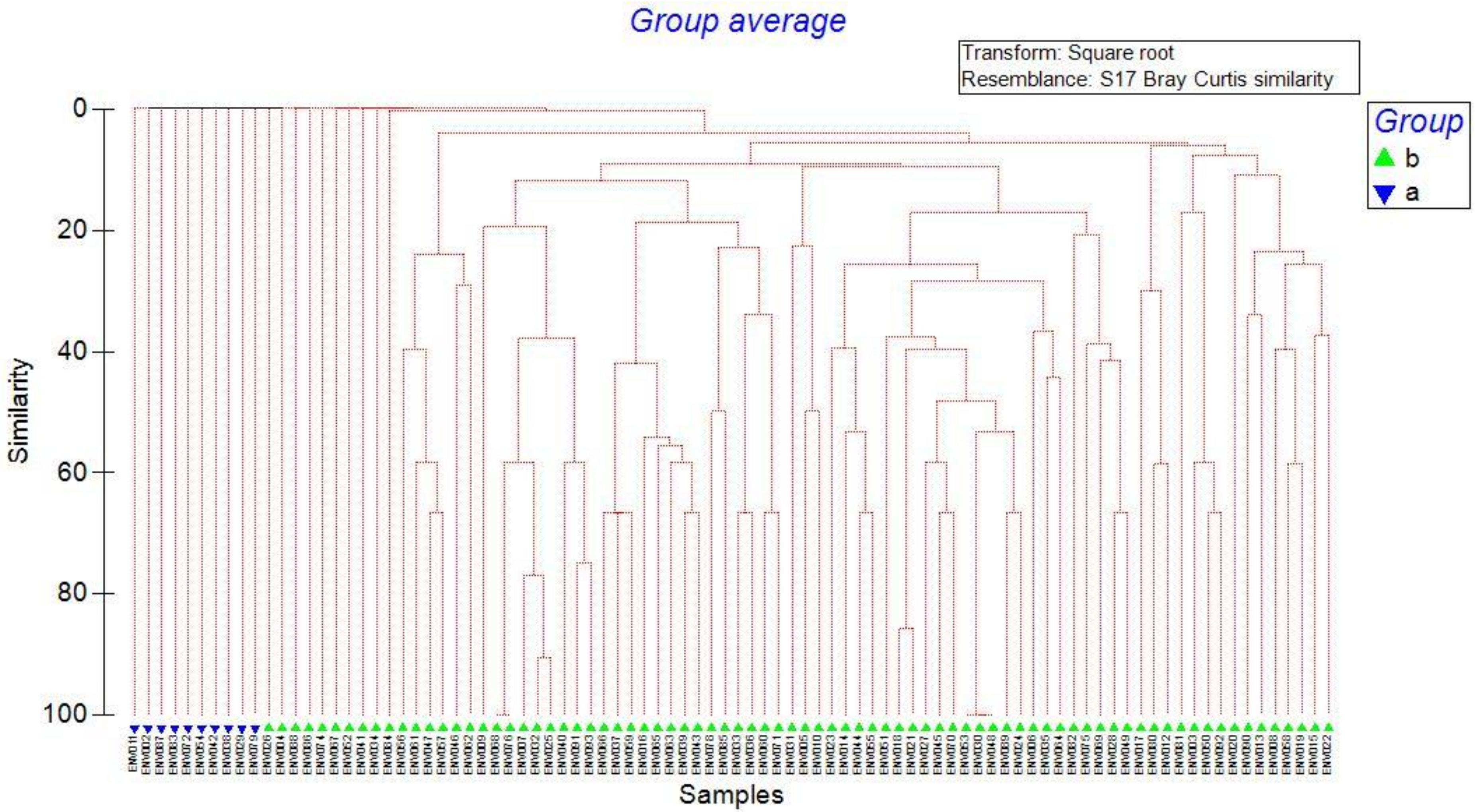


Figure 5.12: Dendrogram of Faunal Groups from Epifaunal Dataset of Grab Data

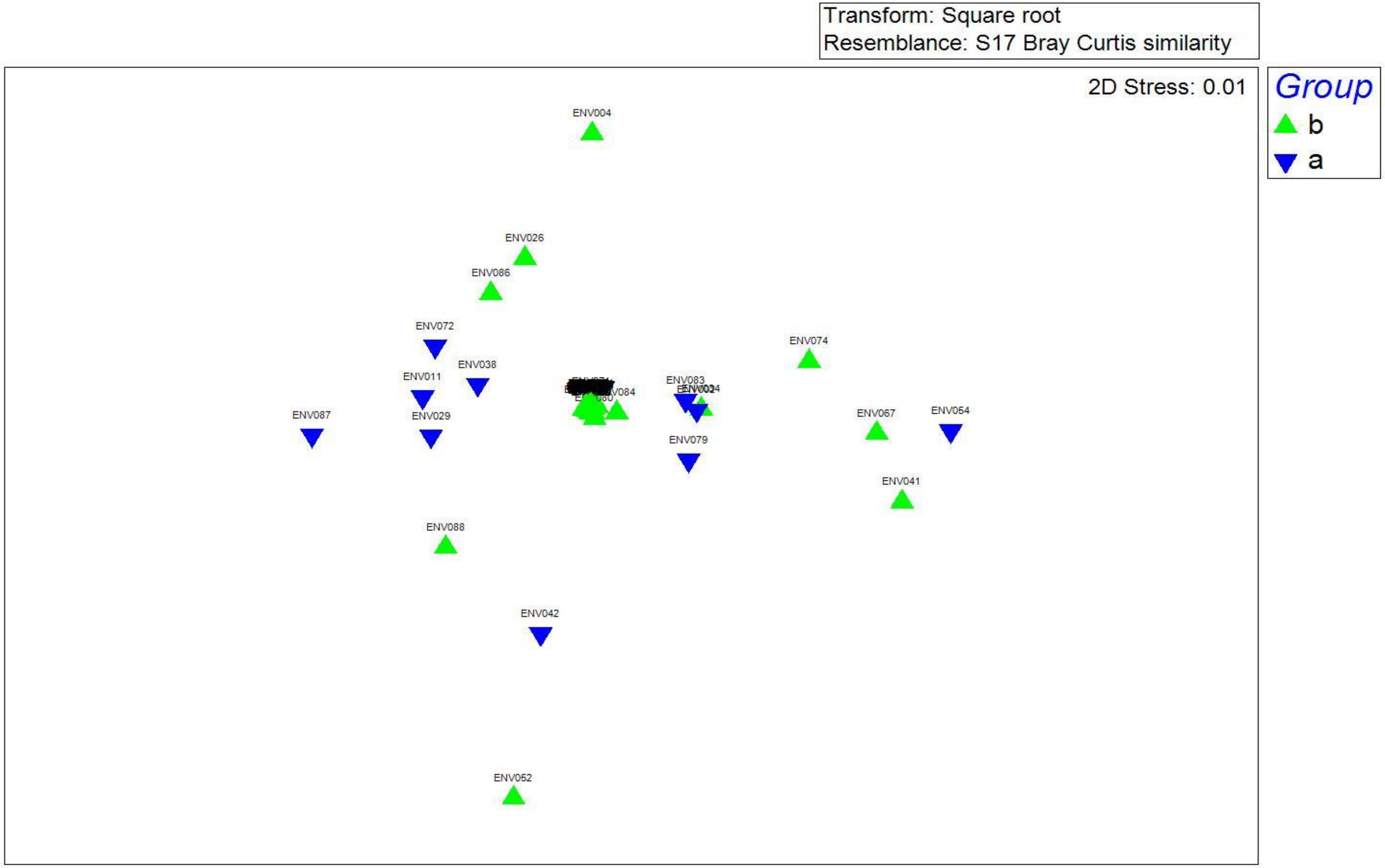


Figure 5.13: Two Dimensional Multi-Dimensional Scaling Plot of Faunal Groups from Epifaunal Dataset of Grab Data

Univariate Analysis

5.1.61 The following univariate statistics were calculated for the combined epibenthic dataset (i.e. epibenthic components of the grabs and DDV data) for each station: number of species (S), abundance (N), Margalef's index of Richness (d), Pielou's Evenness index (J'), Shannon-Wiener Diversity index (H') and Simpson's index of Dominance (λ). The mean of each of these indices was then calculated for each of the biotopes identified from the epifaunal data and these are summarised in Table 5.5.

Table 5.5: Mean (± SD) Univariate Statistics for the Preliminary Epifaunal Benthic Biotopes

Biotope	S	N	d	J’	H’	λ
SS.SSa.OSa	0.1 (±0.3)	0.1 (±0.3)	N/A	N/A	0	N/A
SS.SMx.CMx and/or SS.SMx.OMx	2.94 (±2.50)	2.96 (±2.52)	2.06 (±0.76)	1.00 (±0.01)	0.85 (±0.71)	0.99 (±0.04)

5.1.62 The univariate statistics indicate that the SS.SMx.CMx and/or SS.SMx.OMx complex biotope had the highest mean value for all calculated univariate statistics compared to the SS.SSa.OSa biotope, which was comprised of only one colonial *L. clausa* at ENV079, in the south of the Array Area. The high values for Pielou’s evenness scores (J’) and the Simpson’s index of Dominance (λ) in the SS.SMx.CMx and/or SS.SMx.OMx biotope complex (1.00 ± 0.01, and 0.99 ± 0.04, respectively) indicated an even distribution of abundances among taxa, and that the biotope was not dominated by a high number of individuals within a small number of species. The opposite was noted in SS.SSa.OSa, where insufficient numbers of biota were present to calculate these indices.

Habitat Assessment

Stony Reef Assessment

5.1.63 Analysis of images and DDV footage was conducted to determine if features of interest had any resemblance to the stony reef Annex I habitat, based on criteria adopted by (Irving, 2009). The per image assessment is presented within Annex H.

5.1.64 Potential Annex I geogenic reef was observed at 14 stations (ENV058, ENV064, ENV069, ENV072, ENV073, ENV077, ENV088, ENV090, ENV007, ENV008, ENV009, ENV011, ENV017, and ENV022). All sampling stations were classified as ‘not a reef’ as they all scored a ‘low’ in at least one of the four defining criteria (composition, elevation, extent, or biota), as per (Irving, 2009). Therefore, these areas were not considered to be Annex I cobble/stony reef habitat.

5.1.65 At ENV058, one potential reef structure was deemed to be ‘not a reef’ due to not covering 25 m^2 and having less than 10% coverage. The stone elevation was 64 mm to 5 m, and the structure had <80% epifauna.

5.1.66 At ENV064, one potential reef structure was deemed to be ‘not a reef’ due to not covering 25 m^2 and having less than 10% coverage. The stone elevation was <64 mm and there was no visible fauna.

5.1.67 At ENV069, one potential reef structure was deemed to be ‘not a reef’ due to not covering 25 m^2 and having less than 10% coverage. The stone elevation was 64 mm to 5 m, and the structure was dominated by >80% epifauna.

5.1.68 At ENV072, one potential reef structure was deemed to be ‘not a reef’ due to not covering 25 m^2 and having less than 10% coverage. The stone elevation was 64 mm to 5 m, and the structure had <80% epifauna.

5.1.69 At ENV073, two potential reef structures were deemed to be ‘not a reef’ due to the structures not covering 25 m^2 and having less than 10% coverage. The stone elevation ranged from <64 mm to 64 mm to 5 m, and epifauna coverage ranged from <80% epifauna to being dominated by >80% epifauna.

5.1.70 At ENV077, three potential reef structures were deemed to be ‘not a reef’ due to not covering 25 m^2 and having less than 10% coverage. The stone elevation ranged from <64 mm to 64 mm to 5 m, and epifauna coverage was <80% in all cases.

5.1.71 At ENV088, three potential reef structures were deemed to be ‘not a reef’ due to not covering 25 m^2. The stone elevation in all cases was 64 mm to 5 m, and two structures were dominated by >80% epifauna, with one structure having <80% epifauna.

5.1.72 At ENV090, one potential reef structure was deemed to be ‘not a reef’ due to not covering 25 m^2. The stone elevation was 64 mm to 5 m, and the structure had <80% epifauna.

5.1.73 At ENV007, two potential reef structures were deemed to be ‘not a reef’ due to the structures not covering 25 m^2 and having less than 10% coverage. The stone elevation was <64 mm, and the structures had <80% epifauna.

5.1.74 At ENV008, three potential reef structures were deemed to be ‘not a reef’ due to not covering 25 m^2 and having less than 10% coverage. The stone elevation ranged from <64 mm to 64 mm to 5 m, and epifauna coverage ranged from <80% epifauna to being dominated by >80% epifauna.

5.1.75 At ENV009, four potential reef structures were deemed to be ‘not a reef’ due to covered covering 25 m^2 and having less than 10% coverage. The stone elevation was <64 mm, and the structures ranged from coverage of <80% epifauna to being dominated by >80% epifauna.

5.1.76 At ENV011, two potential reef structures were deemed to be ‘not a reef’ due to the structures not covering 25 m^2 and having less than 10% coverage. The stone elevation ranged from <64 mm to 64 mm to 5 m, and epifauna coverage was <80% in both cases.

5.1.77 At ENV017, three potential reef structures were deemed to be ‘not a reef’ due not covering 25 m^2 and having less than 10% coverage. The stone elevation was <64 mm, and the structures ranged from coverage of <80% epifauna to being dominated by >80% epifauna.

5.1.78 At ENV022, three potential reef structures were deemed to be 'not a reef' due not covering 25 m^2 and having less than 10% coverage. The stone elevation ranged from <64 mm to 64 mm to 5 m, and the structures ranged from coverage of <80% epifauna to being dominated by >80% epifauna.

Biogenic Reefs – Sabellaria spinulosa

5.1.79 Potential small aggregations of *S. spinulosa* were observed in drop down camera imagery at two stations (ENV067 and ENV088). Due to the low area covered by *Sabellaria* tubes and aggregations, the features do not meet the required characteristics to be considered a reef based on the criteria adopted by (Gubbay, 2007).

Biogenic Reefs – Modiolus modiolus

5.1.80 No *M. modiolus* individuals were recorded at any stations, and therefore no assessment of elevation or biodiversity was required, and this Annex I habitat was not present.

Seapen and Burrowing Megafauna Communities

5.1.81 The seapen species *Pennatula phosphorea* was not present at any stations, and the seapen *V. mirabilis* was only present at one station (ENV020), but these species are not necessarily required to classify this habitat (Robson, 2014) if faunal burrows are present. Seabed imagery and DDV analysis revealed faunal burrows were only present at three stations (three at ENV005, and one each at ENV008 and ENV018, all within the Export Cable Corridor). Due to the sparsity of faunal burrows over the surveyed transects, none of these stations met the criteria to be classified as the seapen and burrowing megafauna communities habitat.

Fragile Sponge and Anthozoan Communities on Subtidal Rocky Habitats

5.1.82 Some evidence of hard and soft Porifera was observed throughout the Local Benthic Ecology Study Area, with two stations showing evidence of Porifera. Percentage coverage of sponges in single images ranged from 1% at ENV067 to approximately 5% at ENV090. Other species listed within the fragile sponge and anthozoan communities on rocky habitats (Henry and Roberts, 2014) such as *Alcyonidium diaphanum* were present, but they were present at low abundances and so were not considered representative of this habitat.

5.2 Results – Intertidal ecology

5.2.1 The full intertidal survey report is available separately (Volume 3, Technical Appendix 4.1: Scoping Report Appendix E Benthic Phase 1 Intertidal Walkover Survey Report), with an overview of the main results presented below.

5.2.2 The survey area at Benholm beach was composed of rocky shore, made up of fucoids on exposed linear bedrock pavements, conglomerate rock, boulders and cobbles, as presented in Figure 5.14. The substrate composition reflected bedrock pavements with a conglomerate matrix (Figure 5.14, Image C), with areas of loose boulders and cobbles representing erosional deposits, typically in tidal drainage channels (Figure 5.14, Image D), suggesting tidal erosion of the conglomerate. Tidal drainage channels presented as steep-sided features, with narrow or broad channels of cobbles and boulders, and small patches of sedimentary veneer. Vertical facies generally reflected high algal coverage, with the cobbles and boulders within the channel often sparsely colonised. Exposure across the shore ranged from low to moderate.

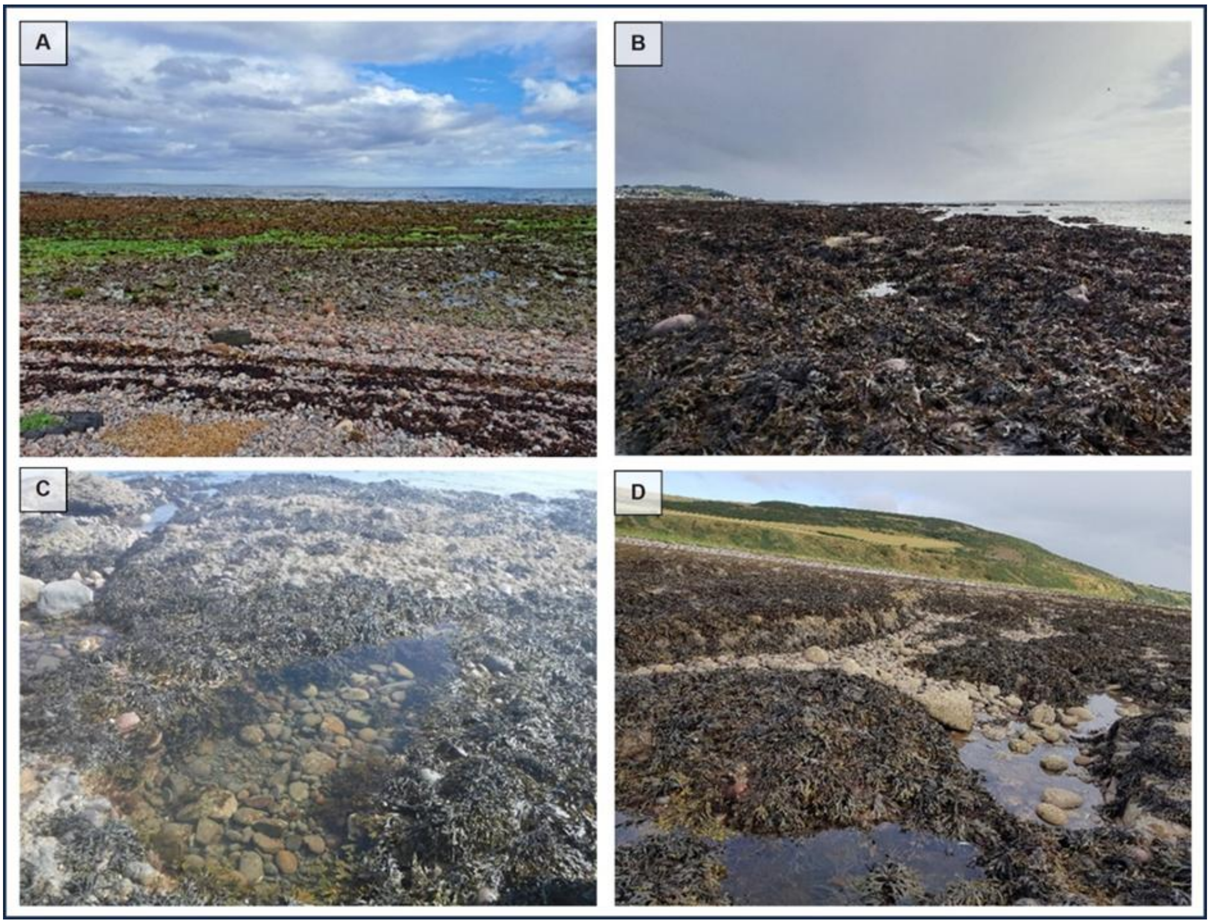
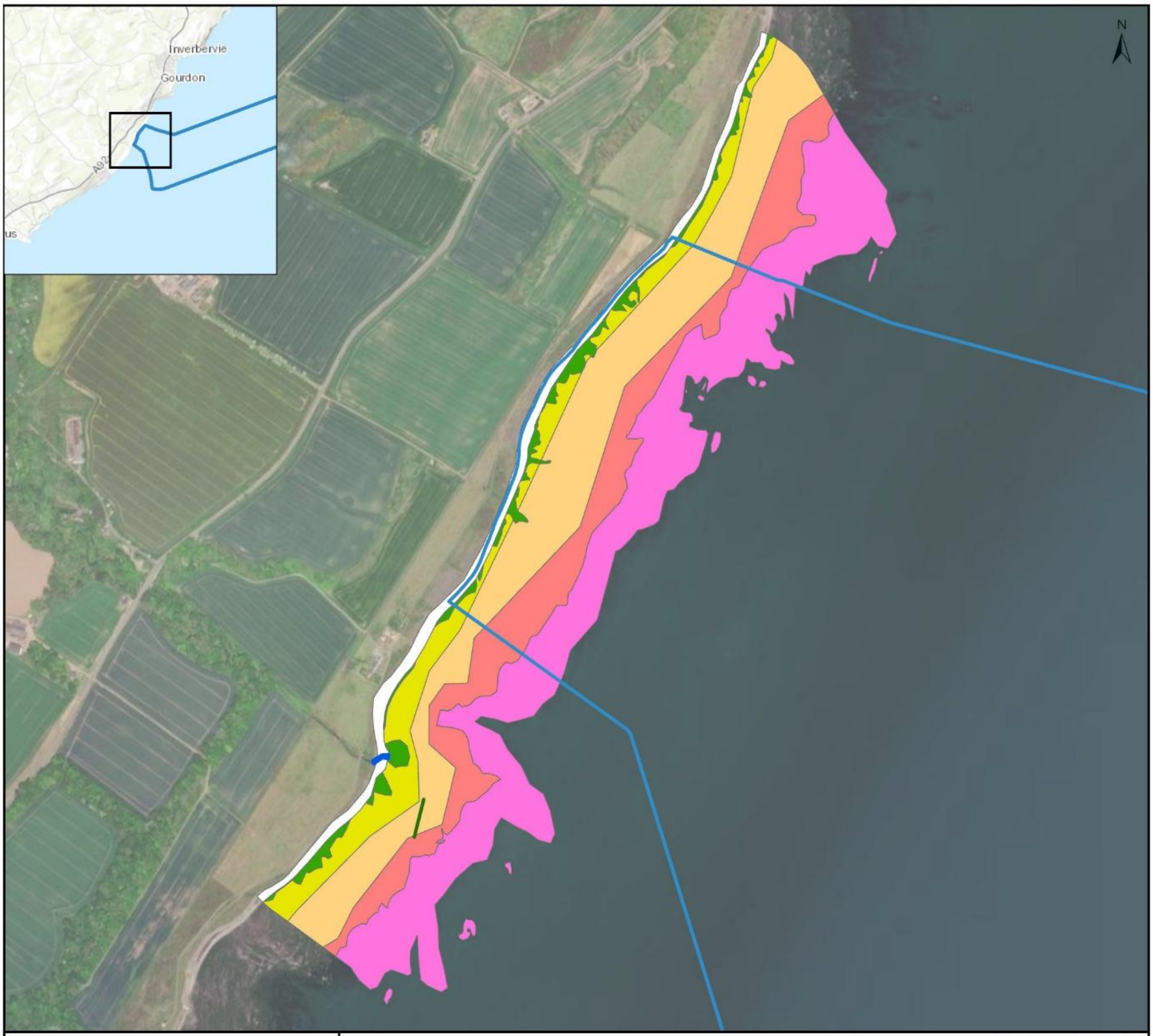


Figure 5.14: Representative Photographs of the Rocky Shore Environment of the Intertidal Survey Area

5.2.3 The rocky shore environment was highly heterogenous, with 17 biotopes identified overall, forming mosaics of two to three biotopes per shore area. The biotopes present within the intertidal survey area are mapped in Figure 5.15.



Project Title: Bowdun Offshore Wind Farm

Figure Title: Summary of Dominant Biotopes and Notable Features within the Intertidal Survey Area

LEGEND

☐ Export Cable Corridor

Biotopes

⬜ Talitrids on the upper shore and strandline (LS.LSa.St.Tal)

🟩 *Ulva spp.* on freshwater-influenced and/or stable upper eulittoral rock (LR.FLR.Eph.Ulv)

🟧 *Semibalanus balanoides, Fucus vesiculosus,* and red seaweeds on exposed to moderately exposed eulittoral rock (LR.HLR.MusB.Sem.FvesR) and Littoral mixed sediment (LS.LMx)

🟨 *Fucus spiralis* on sheltered upper eulittoral rock (LR.LLR.F.Fspi) and *Ulva spp.* on freshwater-influenced and/or stable upper eulittoral rock (LR.FLR.Eph.Ulv)

🟥 *Fucus serratus* on sheltered lower eulittoral rock (LR.LLR.F.Fserr) and Semibalanus balanoides and *Littorina spp.* on exposed to moderately exposed eulittoral boulders and cobbles (LR.HLR.MusB.Sem.LitX)

🟪 *Laminaria hyperborea* forest and foliose red seaweeds on moderately exposed upper infralittoral rock (IR.MIR.KR.Lhyp.Ft)

🟦 Area of freshwater input

— Dense band of *A. nodosum*

0 0.05 0.1 0.2 nm
0 0.25 0.5 km

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

VER	DATE	DETAILS	BY	CHK
00	25/06/25	First Issue	MJ	HM
01	10/10/25	Revision	MJ	SW
-	-	-	-	-
-	-	-	-	-

Drawing Number:
EOR0770A-ES-BEN-T010-01

Data Sources: Client, Intertidal Survey Results

Service Layer Credits: World Imagery: Maxar, Microsoft
World Topographic Map: Esri UK, Esri, HERE, Garmin, USGS, NGA

Figure 5.15: Summary of Dominant Biotopes and Notable Features within the Intertidal Survey Area

Strandline and Upper Shore

5.2.4 The strandline on the upper shore was comprised of the biotopes LS.LSa.St.Tal and littoral coarse sediment (LS.LCS), and epibiota were scarce except for talitrid amphipods and unidentified white polychaetes.

5.2.5 A total of 30 quadrats corresponded to the biotope LR.LLR.F.Fspi. The spiral wrack represented the dominant cover within the images captured, with channelled wrack *Pelvetia canaliculata* and gutweed *Ulva intestinalis* also present in some quadrats. The substrate was characterised by bedrock, cobbles, and boulders.

5.2.6 A total of 17 quadrats corresponded to the biotope LR.FLR.Eph.Ulv. The gutweed provided the dominant cover within these quadrats, with channelled wrack also noted as being abundant throughout. The substrate was characterised by boulders, cobbles, coarse sand and shell fragments, and silt.

5.2.7 Tidal or rock pools in the upper shore were sparse and generally shallow and characterised by the presence of dense coverage of spiral wrack and gutweed, and *Ascophyllum nodosum* was present at the fringes and the substrate comprised cobbles, boulders, gravel, silt, and coarse sand with shell fragments.

Mid Shore

5.2.8 A total of eight biotopes were identified in the mid shore zone, with the two dominant biotopes being LR.LLR.F.Fves and LR.LLR.F.Fspi, representing 60% and 18% respectively of the biotopes identified in this zone. The remaining six biotopes were *Ascophyllum nodosum* on full salinity mid eulittoral rock (LR.LLR.F.Asc.FS), LR.LLR.F.Fserr, *Semibalanus balanoides*, *Fucus vesiculosus*, and red seaweeds on exposed to moderately exposed eulittoral rock (LR.HLR.MusB.Sem.FvesR), *Semibalanus balanoides* and *Littorina* spp. on exposed to moderately exposed eulittoral boulders and cobbles (LR.HLR.MusB.Sem.LitX), Littoral mixed sediment (LS.LMx), and LR.MLR.BF.Fser. Tidal pools with a range of algae including *Corallina officinalis*, *Lithophyllaceae* sp., and *Scytosiphon lomentaria* were also present.

Lower Shore

5.2.9 This area of the shore generally comprised bedrock, boulders, cobbles, coarse sand and shell fragments, and silt. The bedrock consisted of conglomerate matrix and exposed igneous pavement. A total of seven biotopes were identified in the lower shore; the three dominant biotopes were LR.LLR.F.Fserr, IR.MIR.KR.Lhyp.Ft, and LR.MLR.BF.Fser. The remaining four biotopes identified in the lower shore zone were *Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock (LR.MLR.BF.Fser.R), LR.LLR.F.Fves, LR.HLR.MusB.Sem.LitX, and *Osmundea pinnatifida* on moderately exposed mid eulittoral rock (LR.HLR.FR.Osm). Tidal or rock pools in the lower shore were generally shallow and characterised by the presence of dense coverage of serrated wrack and/or kelp.

6 Summary

6.1.1 The subtidal site-specific survey consisted of infaunal grab samples and DDV imagery. The seabed recorded across the Local Benthic Ecology Study Area included boulders, megaripples, and smaller ripples. The subtidal sediments were comprised of an average of 6.43% gravel, 86.66% sand, and 6.91% mud, with coarser sediments found in the west and along the Export Cable Corridor. In the west of the Export Cable Corridor, a small number of stations were classified as slightly gravelly muddy sand.

6.1.2 A total of 46 sediment samples were analysed for sediment chemistry. Levels of contamination were found to exceed the Marine Scotland AL1 for chromium, lead, and arsenic, and the CSQG TEL for arsenic was exceeded at 41 stations. All concentrations of PCBs, THCs, and organotins at all stations were below all relevant thresholds. The PAH concentrations were mostly below the CSQG TEL and PEL thresholds, with only two stations in the west of the Export Cable Corridor exceeding the CSQG TEL threshold.

6.1.3 The benthic communities were dominated by the biotope SS.SSa.CFiSa.EpusOborApri across the Array Area, and most of the east of the Export Cable Corridor. The west of the Export Cable Corridor was dominated by SS.SSa.CMuSa.AalbNuc close to the nearshore, and SS.SSa.CMuSa immediately to the east. Single stations of SS.SCS.CCS.MedLumVen and SS.SSa.OSa were recorded in the west of the Export Cable Corridor.

6.1.4 The Intertidal Area at Benholm beach was comprised of rocky shore fucoid communities, with exposed linear bedrock pavements, conglomerate rock, and boulders and cobbles. The upper shore was comprised of LS.LSa.St.Tal and LS.LCS, and a mix of LR.LLR.F.Fspi and LR.FLR.Eph.Ulv. The mid shore was comprised mainly of LR.LLR.F.Fves and LR.LLR.F.Fspi, and the lower shore was dominated by LR.LLR.F.Fserr, IR.MIR.KR.Lhyp.Ft, and LR.MLR.BF.Fser.

6.1.5 The habitat assessment found no evidence of Annex I cobble/stony reef habitat, no evidence of *S. spinulosa* or *M. modiolus* reefs, seapen and burrowing megafauna communities, or fragile sponge and anthozoan communities on subtidal rocky habitats.

Important Ecological Features

6.1.6 Important Ecological Features (IEFs) are important habitats, species, and ecosystems which could potentially be impacted by the Proposed Developed. The Chartered Institute for Ecology and Environmental Management guidance was used to identify IEFs within the Local Benthic Ecology Study Area. IEFs can be either individual species, biotopes, or biotope groups, and they are assigned a value based on their commercial, ecological or conservation importance. Table 6.1 defines the IEF criteria, and Table 6.2 presents the IEFs present within the Local Benthic Ecology Study Area and their value. As defined in Paragraph 2.1.2, the Local Benthic Ecology Study Area encompasses the ZoI for benthic receptors, therefore only IEFs present within this area have the potential to be affected by the Proposed Development.

Table 6.1: Defining Criteria for IEFs

Value of IEF	Defining Criteria
International	Internationally designated sites. Species of habitats protected under international law (i.e. Annex I habitats listed as qualifying interests of SACs).
National	Nationally designated sites. Species protected under national law. OSPAR List of Threatened and/or Declining Species, and International Union for Conservation of Nature (IUCN) Red List Species that have nationally important populations within the Project Development, particularly in the context of species/habitats that may be rare or threatened in Scottish waters. Species that are listed as PMFs as they have been deemed features characteristic of Scottish marine environments and are likely to be one of the characteristic species within the Local Benthic Ecology Study Area.
Regional	OSPAR List of Threatened and/or Declining Species, and IUCN Red List Species that have regionally important populations within the Project Development (i.e. are locally widespread and/or abundant). Species that form an important prey item for other species of conservation or commercial value and are key components of the benthic assemblages within the Project Development. Species that are listed as PMFs but as not a key contributing species to the characterisation of the Local Benthic Ecology Study Area.
Local	Species that are of commercial importance but do not form a key component of the benthic assemblages within the Project Development (e.g. they may be exploited in shallower/deeper waters outside the Project Development). Species is common throughout Scottish waters but forms a component of the benthic assemblages in the Project Development Local Benthic Ecology Study Area.

Table 6.2: IEFs within the Local Benthic Ecology Study Area

IEF	Description and Representative Biotopes	Protection Level	Conservation Designation	Value
Subtidal Habitats and Species				
Offshore subtidal sands and gravels	SS.SSa.CFiSa.EpusOborApri SS.SSa.OSa SS.SCS.CCS.MedLumVen	None	PMF (Scotland) UK Biodiversity Action Plan (BAP) priority habitat	Regional
Offshore muddy and mixed sediments	SS.SSa.CMuSa.AalbNuc SS.SSa.CMuSa	None	UK BAP priority habitat	Regional
Intertidal Habitats and Species				
Tide-swept algal communities	LR.LLR.F.Fves LR.LLR.F.Fspi LR.LLR.F.Fserr LR.MLR.BF.Fser LR.LLR.F.Asc.FS LR.FLR.Eph.Ulv LR.MLR.BF.Fser.R	None	PMF (Scotland)	Regional
Kelp beds	IR.MIR.KR.Lhyp.Ft	None	PMF (Scotland) OSPAR habitat	Regional
Intertidal rocky and mixed sediment communities	LR.HLR.MusB.Sem.FvesR LR.HLR.MusB.Sem.LitX LR.HLR.FR.Osm LS.LMx	None	UK BAP priority habitat	Regional

References

Aberdeen OWF Limited. (2010). *Request for an Environmental Impact Assessment (EIA) Scoping Opinion.* Vattenfall pp.158.

Alzieu, C. L., Sanjuan, J., Deltreil, J. P. and Borel, M. (1986). *Tin contamination in Arcachon Bay: Effects on oyster shell anomalies*. Marine Pollution Bulletin, 17 (11), pp.494-498. DOI:https://doi.org/10.1016/0025-326X(86)90636-3.

Axelsson, M., Dewey, S. and Allen, C. (2014). *Analysis of seabed imagery from the 2011 survey of the Firth of Forth Banks Complex, the 2011 IBTS Q4 survey and additional deep-water sites from Marine Scotland Science surveys (2012).* JNCC, Report No. 471. Peterborough, UK

Burreau, S., Zebühr, Y., Broman, D. and Ishaq, R. (2006). *Biomagnification of PBDEs and PCBs in food webs from the Baltic Sea and the northern Atlantic Ocean*. Science of The Total Environment, 366 (2-3), pp.659-72. DOI:10.1016/j.scitotenv.2006.02.005.

CCME. (2017). *Canadian Water Quality Guidelines for the Protection of Aquatic Life. CCME Water Quality Index. User's Manual 2017 Update.* Canadian Environmental Quality Guidelines pp.23.

Cefas. (2005). *A Review of the Contaminant Status of the Irish Sea*. Cefas Contract Report, C2436.

Cefas. (2024). *One Benthic: New Insights using Big Data* [Online]. Available at: https://sway.cloud.microsoft/HM5VkWvBoZ86atYP?ref=Link. Accessed on: 02 June 2024.

Clarke, K. R. and Gorley, R. N. (2015). *PRIMER v7: User Manual/Tutorial PRIMER-E.* Plymouth, UK pp.300.

Connor, D., W., Allen, J. H., Golding, N., Howell, K. L., Lieberknecht, L. M., Northern, K. O. and Reker, J. B. (2004). *The Marine Habitat Classification for Britain and Ireland.* JNCC

Cooper, K. M. and Barry, J. (2017). *A big data approach to macrofaunal baseline assessment, monitoring and sustainable exploitation of the seabed*. Scientific Reports, 7 (1), pp.18.

Croll, D. A., Ellis, A. A., Adams, J., Cook, A. S. C. P., Garthe, S., Goodale, M. W., Hall, C. S., Hazen, E., Keitt, B. S., Kelsey, E. C., Leirness, J. B., Lyons, D. E., McKown, M. W., Potiek, A., Searle, K. R., Soudijn, F. H., Rockwood, R. C., Tershy, B. R., TInker, M., VanderWerf, A., WIlliams, K. A., Young, L. and Zilliacus, K. (2022). *Framework for assessing and mitigating the impacts of offshore wind energy development on marine birds.* Biological Conservation, 276 (1), pp.15.

Davies, J., Baxter, J., Bradley, M., Connor, D., Khan, J., Murray, E., Sanderson, W., Turnbull, C. and Vincent, M. (2001). *Marine Monitoring Handbook.* JNCC pp.405.

DNV. (2013). *Quantification of Barents Sea Sponge Communities from Video and Still Photo Material*. Report No: 12NCQKD-3.

EMODnet. (2025). *EMODnet Map Viewer* [Online]. Available at: https://emodnet.ec.europa.eu/geoviewer/. Accessed on: August 2025.

Folk, R. L. (1954). *The distinction between grain size and mineral composition in sedimentary-rock nomenclature*. The Journal of Geology, 62 (4), pp.344-359.

Folk, R. L. and Ward, W. C. (1957). *Brazos River bar [Texas]; a study in the significance of grain size parameters*. Journal of Sedimentary Research, 27 (1), pp.3-26. DOI:10.1306/74d70646-2b21-11d7-8648000102c1865d.

G-Tec. (2024a). *Bowdun (E3) Geophysical Results Report - E3 EXC.* Geophysical Site Investigation

G-Tec. (2024b). *Bowdun (E3) Geophysical Results Report - E3 OWF.* Geophysical Site Investigation

Golding, N., Albrecht, J. and McBreen, F. (2020). *Refining criteria for defining areas with a 'low resemblance' to Annex I stony reef; Workshop Report.* JNCC Report No. 656. Peterborough, UK pp.38.

Gubbay, S. (2007). *Defining and managing Sabellaria spinulosa reefs: Report of an inter-agency workshop 1-2 May.* JNCC. Peterborough pp.26.

Henry, L. A. and Roberts, J. M. (2014). *Epibiota Remote Monitoring from Digital Imagery: Operation Guidelines.* NMBAQC's Best Practice Guidance.

Hiscock, K. (1996). *Marine Nature Conservation Review: Rationale and methods. Coasts and seas of the United Kingdom.* MNCR series. Joint Nature Conservation Committee. Peterborough pp.91.

Hitchin, R., Turner, J. A. and Verling, E. (2015). *NMBAQC Epibiota Remote Monitoring from Digital Imagery: Operational Guidelines.*

Honda, M. and Suzuki, N. (2020). *Toxicities of Polycyclic Aromatic Hydrocarbons for Aquatic Animals*. Int J Environ Res Public Health, 17 (4). DOI:10.3390/ijerph17041363.

Huang, B., Guo, Z., Xiao, X., Zeng, P. and Peng, C. (2019). *Changes in chemical fractions and ecological risk prediction of heavy metals in estuarine sediments of Chunfeng Lake estuary, China*. Marine Pollution Bulletin, 138**,** pp.575-583. DOI:https://doi.org/10.1016/j.marpolbul.2018.12.015.

Inch Cape Offshore Limited. (2018a). *Offshore Environmental Statement Chapters 1-23 (Full Report).* Offshore Environmental Statement. Inch Cape Offshore Limited pp.1701.

Inch Cape Offshore Limited. (2018b). *Volume 1B: Chapters 12 - 18.* EIA Report Volume 1. Inch Cape Offshore Limited pp.454.

Irving, R. (2009). *The identification of the main characteristics of stony reef habitats under the Habitats Directive.* JNCC. Peterborough pp.44.

Jenkins, C., Eggleton, J. D., Albrecht, J., Barry, J., Duncan, G., Golding, N. and O'Connor, J. (2015). *North Norfolk Sandbank and Saturn Reef cSAC.SCI Management Investigation Report.* JNCC/Cefas Partnership Report Series, Report No.7.

JNCC. (2013). *SACFOR abundance scale used for both littoral and sublittoral taxa from 1990 onwards.*

JNCC. (2019). *Annex I Sandbanks in the UK version 3 - 2019 (Public) Polygons* [Online]. Available at: https://hub.jncc.gov.uk/assets/c80ad259-f346-4afc-b5ec-2a0b94e8ff6e. Accessed on: 16 November 2023.

JNCC. (2021). *Annex I Reefs in UK waters (Open Data) (Version 8.3, 2022) 2021* [Online]. Available at: https://hub.jncc.gov.uk/assets/8f886e47-31d6-477e-9240-65ac42bee709. Accessed on: 16 November 2023.

JNCC. (2022). *The Marine Habitat Classification for Britain and Ireland Version 22.04* [Online]. Available at: https://mhc.jncc.gov.uk/. Accessed on: January 2024.

JNCC. (2025). *MPA Mapper* [Online]. Available at: https://jncc.gov.uk/mpa-mapper/. Accessed on: March 2025.

Kincardine OWF Limited. (2016). *Kincardine Offshore Windfarm Environmental Statement (Full Report).* Atkins and Kincardine Offshore Windfarm Limited pp.652.

Langenkämper, D., Zurowietz, M., Schoening, T. and Nattkemper, T. W. (2017). *BIIGLE 2.0 - Browsing and Annotating Large Marine Image Collections*. Frontiers in Marine Science, 4. DOI:10.3389/fmars.2017.00083.

Long, D. (2006). *BGS detailed explanation of seabed sediment modified folk classification*. pp.7pp.

Maddock, A. (2011). *UK Biodiversity Action Plan Priority Habitat Descriptions*. JNCC pp.103.

Madgett, A. S., Yates, K., Webster, L., McKenzie, C., Brownlow, A. and Moffat, C. F. (2022). *The concentration and biomagnification of PCBs and PBDEs across four trophic levels in a marine food web*. Environmental Pollution, 309, pp.119752. DOI:https://doi.org/10.1016/j.envpol.2022.119752.

Mainstream Renewable Power. (2019). *Chapter 14 - Benthic Ecology.* Neart na Gaoithe Offshore Wind Farm Environmental Statement. Neart na Gaoithe pp.28.

Marine Scotland. (2017). *Pre-disposal Sampling Guidance Version 2 - November 2017.*

Marine Scotland. (2025). *Concentration of PCBs in Biota and Sediment* [Online]. https://marine.gov.scot/sma/assessment/concentration-pcbs-biota-and-sediment. Accessed on 04 March 2025.

Mason, C. (2022). *Particle Size Analysis (PSA) for Supporting Biological Analysis*. NMBAQC's Best Practice Guidance.

McQuillan, J. S., Kille, P., Powell, K. and Galloway, T. S. (2014). *The regulation of copper stress response genes in the polychaete Nereis diversicolor during prolonged extreme copper contamination*. Environ Sci Technol, 48 (22), pp.13085-92. DOI:10.1021/es503622x.

MD-LOT. (2024). *Marine Directorate Licensing Operations Team Scoping Opinion Bowdun Offshore Wind Farm.* Scoping Opinion pp.43.

Meador, J. P., Stein, J. E., Reichert, W. L. and Varanasi, U. (1995). *Bioaccumulation of polycyclic aromatic hydrocarbons by marine organisms*. Rev Environ Contam Toxicol, 143, pp.79-165. DOI:10.1007/978-1-4612-2542-3_4.

Morris, E. (2015). *Defining Annex I biogenic Modiolus modiolus reef habitat under the Habitats Directive: Report of an inter-agency workshop, March 4th & 5th, 2014.* JNCC

MvOWL. (2023). *Morven Offshore Wind Array Project Environmental Impact Assessment Scoping Report.* EnBW and BP pp.365.

NatureScot. (2020). *Priority Marine Features in Scotland's seas* [Online]. Available at: https://www.nature.scot/doc/priority-marine-features-scotlands-seas-habitats. Accessed on: 10 September 2024.

Neff, J. (2002). *Bioaccumulation in Marine Organisms: Effect of Contaminants from Oil Well Produced Water*. pp.241-313.

Neff, J. M. (1997). *Ecotoxicology of arsenic in the marine environment*. Environmental Toxicology and Chemistry, 16 (5), pp.917-927. DOI:https://doi.org/10.1002/etc.5620160511.

NMPi. (2025). *Marine Scotland Maps (NMPi)* [Online]. Available at: https://marinescotland.atkinsgeospatial.com/nmpi/. Accessed on: June 2025.

Ocean Ecology. (2024). *Bowdun Offshore Wind Farm Benthic Characterisation Survey 2023: Survey Report*.

Okoro, H. K., Snyman, R., Fatoki, O. S., Adekola, F. A., Ximba, B. J. and Slabber, M. Y. (2015). *Lysosomal Membrane Stability of the Mussel, Mytilus galloprovincialis (L.), as a Biomarker of Tributyltin Exposure*. Bulletin of Environmental Contamination and Toxicology, 94, pp.609-613.

OSPAR Commission. (2008a). *Nomination Nucella lapillus, Dog Whelk.* Case Reports for the OSPAR List of Threatened and/or Declining Species and Habitats. OSPAR Commission pp.4.

OSPAR Commission. (2008b). *Nomination: Seapen and burrowing megafauna.* Case Reports for the OSPAR List of Threatened and/or Declining Species and Habitats. OSPAR Commission pp.4.

Ossian OWFL. (2023). *Ossian Array EIA Scoping Report.* Ossian pp.353.

Ossian OWFL. (2024). *Array Environmental Impact Assessment.*

Pearce, B., Grubb, L., Earnshaw, S., Pitts, J. and Goodchild, R. (2014). *Biotope assignment of grab samples from four surveys undertaken in 2011 across Scotland's seas (2012).* JNCC. Peterborough, UK pp.63.

Pearce, B. and Kimber, J. (2020). *The Status of Sabellaria spinulosa Reef off the Moray Firth and Aberdeenshire Coasts and Guidance for Conservation of the Species off the Scottish East Coast CR/2018/38.* Scottish Marine and Freshwater Science. Marine Scotland Science. Document Number 11, No 17. pp.104.

Robson, L. (2014). *JNCC clarifications on the habitat definitions of two habitat Features of Conservation Importance: Mud habitats in deep water, and Sea-pen and burrowing megafauna communities*. JNCC Report.

Scottish Government. (2020). *Sectoral Marine Plan for Offshore Wind Energy.* The Scottish Government. Edinburgh, Scotland pp.78.

Seagreen Wind Energy Limited. (2012). *Chapter 11: Benthic ecology and intertidal ecology.* Environmental Statement Volume I. Seagreen Wind Energy pp.74pp.

SEPA. (2018). *Angiosperm Monitoring for the EU Water Framework Directive 2013 – 2015: Baseline seagrass surveys of the Montrose Basin, Eden Estuary, Forth Estuary and Loch Ryan.* SEPA. North Lanarkshire, Scotland pp.67.

Silva, M. C., do Nascimento Monte, C., de Souza, J. R., Selfe, A. C. C. and Ishihara, J. H. (2024). *Mapping of metals contamination in coastal sediments around the world in the last decades: A bibliometric analysis and systematic review*. Marine Pollution Bulletin, 205**,** pp.116572. DOI:https://doi.org/10.1016/j.marpolbul.2024.116572.

Sotheran, I. and Crawford-Avis, O. (2013). *Mapping habitats and biotopes from acoustic datasets to strengthen the information base of Marine Protected Areas in Scottish Waters.* JNCC Report No. 503. Peterborough, UK pp.87.

Sotheran, I. and Crawford-Avis, O. (2014). *Mapping habitats and biotopes to strengthen the information base of Marine Protected Areas in Scottish waters, Phase 2 (Eastern Approaches to the Firth of Forth).* JNCC Report No. 526. Peterborough, UK pp.27.

SSE Renewables. (2022). *Chapter 8: Benthic Subtidal and Intertidal Ecology.* Berwick Bank Wind Farm Environmental Impact Assessment Report Volume 2. Berwick Bank Wind Farm pp.133.

Statoil. (2015). *Hywind Scotland Pilot Park: Environmental Statement (Full Report).* Document Number A-100142-S35-EIAS-001. pp.462.

Turner, J., Hitchin, B., Verling, E. and van Rein, H. (2016). *Epibiota Remote Monitoring from Digital Imagery: Interpretation Guidelines.*

Tyler-Walters, H., James, B., Carruthers, M., Wilding, C., Durkin, O., Lacey, C., Philpott, E., Adams, L., Chaniotis, P. D., Wilkes, P. T. V., Seeley, R., Neilly, M., Dargie, J. and Crawford-Avis, O. T. (2016). *Descriptions of Scottish Priority Marine Features (PMFs).* Scottish Natural Heritage Commissioned Report No. 406 pp.140.

Vuorinen, P. J., Parmanne, R., Vartiainen, T., Keinänen, M., Kiviranta, H., Kotovuori, O. and Halling, F. (2002). *PCDD, PCDF, PCB and thiamine in Baltic herring (Clupea harengus L.) and sprat [*

Sprattus sprattus (L.)] as a background to the M74 syndrome of Baltic salmon (Salmo salar L.). ICES Journal of Marine Science, 59 (3), pp.480-496. DOI:10.1006/jmsc.2002.1200.

Worsfold, T. and Hall, D. (2010). *Guidelines for processing marine macrobenthic invertebrate samples: a Processing Requirements Protocol*. National Marine Biological Analytical Quality Control Scheme.

Wyn, G. and Brazier, P. (2001). *Procedural Guideline No. 3-1 - In situ intertidal biotope recording*. *In:* Davies, J., Baxter, J., Bradley, M., Connor, D., Khan, J., Murray, E., Sanderson, W., Turnbull, C. and Vincent, M. (eds.) *Marine Monitoring Handbook.* Peterborough: JNCC.

Wyn, G., Brazier, P., Birch, K., Bunker, A., Cooke, A., Jones, M., Lough, N., McMath, A. and Roberts, S. (2006). *Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey.* Bangor, Countryside Council for Wales.

Zahn, R. K., Zahn, G., Müller, W. E. G., Kurelec, B., Rijavec, M., Batel, R. and Given, R. (1981). *Assessing consequences of marine pollution by hydrocarbons using sponges as model organisms*. Science of The Total Environment, 20 (2), pp.147-169. DOI:https://doi.org/10.1016/0048-9697(81)90060-7.

ANNEX A. PSA RESULTS FOR THE BENTHIC SUBTIDAL SURVEY

Sampling Station	Latitude	Longitude	Textural Group Classification	Folk Classification	Folk and Ward Sorting	Gravel (%)	Sand (%)	Mud (%)	BSH
ENV028	57.061	-1.395	Slightly Gravelly Sand	Medium Sand	Poorly Sorted	3.58%	90.86%	5.56%	A5.2 Sand and Muddy Sand
ENV029	57.049	-1.359	Sand	Medium Sand	Moderately Well Sorted	0.00%	98.48%	1.52%	A5.2 Sand and Muddy Sand
ENV030	57.038	-1.322	Slightly Gravelly Sand	Medium Sand	Moderately Well Sorted	1.19%	96.43%	2.38%	A5.2 Sand and Muddy Sand
ENV031	57.027	-1.285	Gravelly Sand	Coarse Sand	Poorly Sorted	9.16%	82.32%	8.52%	A5.1 Coarse Sediment
ENV032	57.009	-0.826	Gravelly Sand	Very Coarse Sand	Poorly Sorted	28.76%	68.12%	3.12%	A5.1 Coarse Sediment
ENV033	57.004	-1.212	Gravelly Sand	Very Coarse Sand	Poorly Sorted	24.90%	72.55%	2.56%	A5.1 Coarse Sediment
ENV034	56.993	-1.175	Slightly Gravelly Sand	Medium Sand	Poorly Sorted	2.29%	95.21%	2.50%	A5.2 Sand and Muddy Sand
ENV035	56.990	-1.207	Slightly Gravelly Sand	Medium Sand	Poorly Sorted	3.60%	91.13%	5.27%	A5.2 Sand and Muddy Sand
ENV036	57.001	-1.244	Gravelly Sand	Coarse Sand	Poorly Sorted	22.34%	76.93%	0.73%	A5.1 Coarse Sediment
ENV037	57.013	-1.280	Gravelly Sand	Coarse Sand	Poorly Sorted	11.74%	86.43%	1.83%	A5.1 Coarse Sediment

Sampling Station	Latitude	Longitude	Textural Group Classification	Folk Classification	Folk and Ward Sorting	Gravel (%)	Sand (%)	Mud (%)	BSH
ENV038	57.024	-1.318	Slightly Gravelly Sand	Fine Sand	Moderately Sorted	0.23%	94.70%	5.07%	A5.2 Sand and Muddy Sand
ENV039	57.035	-1.354	Slightly Gravelly Sand	Medium Sand	Poorly Sorted	0.28%	94.14%	5.58%	A5.2 Sand and Muddy Sand
ENV040	57.046	-1.391	Gravelly Sand	Medium Sand	Poorly Sorted	6.41%	90.82%	2.77%	A5.1 Coarse Sediment
ENV041	57.032	-1.387	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	1.55%	95.95%	2.50%	A5.2 Sand and Muddy Sand
ENV042	57.021	-1.350	Sand	Medium Sand	Moderately Well Sorted	0.00%	98.40%	1.60%	A5.2 Sand and Muddy Sand
ENV043	57.010	-1.313	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	1.80%	93.75%	4.44%	A5.2 Sand and Muddy Sand
ENV044	56.998	-1.276	Gravelly Sand	Coarse Sand	Poorly Sorted	16.68%	82.28%	1.03%	A5.1 Coarse Sediment
ENV045	56.987	-1.239	Slightly Gravelly Muddy Sand	Medium Sand	Poorly Sorted	1.70%	87.05%	11.25%	A5.2 Sand and Muddy Sand
ENV046	56.976	-1.203	Gravelly Sand	Medium Sand	Poorly Sorted	8.56%	90.28%	1.16%	A5.1 Coarse Sediment
ENV047	56.973	-1.235	Gravelly Sand	Medium Sand	Poorly Sorted	10.33%	87.91%	1.77%	A5.1 Coarse Sediment
ENV048	56.984	-1.272	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	1.17%	97.52%	1.31%	A5.2 Sand and Muddy Sand

Sampling Station	Latitude	Longitude	Textural Group Classification	Folk Classification	Folk and Ward Sorting	Gravel (%)	Sand (%)	Mud (%)	BSH
ENV049	56.996	-1.309	Gravelly Sand	Coarse Sand	Poorly Sorted	9.75%	84.19%	6.06%	A5.1 Coarse Sediment
ENV050	57.007	-1.345	Slightly Gravelly Sand	Medium Sand	Poorly Sorted	4.45%	92.37%	3.18%	A5.2 Sand and Muddy Sand
ENV051	57.018	-1.382	Slightly Gravelly Muddy Sand	Fine Sand	Poorly Sorted	1.42%	84.20%	14.37%	A5.2 Sand and Muddy Sand
ENV052	57.029	-1.419	Slightly Gravelly Muddy Sand	Fine Sand	Poorly Sorted	2.90%	85.96%	11.14%	A5.2 Sand and Muddy Sand
ENV053	57.004	-1.378	Gravelly Sand	Medium Sand	Poorly Sorted	6.69%	86.80%	6.51%	A5.1 Coarse Sediment
ENV054	56.993	-1.341	Slightly Gravelly Sand	Medium Sand	Moderately Well Sorted	0.40%	97.75%	1.86%	A5.2 Sand and Muddy Sand
ENV055	56.981	-1.305	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	2.80%	93.39%	3.80%	A5.2 Sand and Muddy Sand
ENV056	56.970	-1.268	Gravelly Sand	Coarse Sand	Very Poorly Sorted	25.32%	69.81%	4.87%	A5.1 Coarse Sediment
ENV057	56.959	-1.230	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	0.61%	97.75%	1.63%	A5.2 Sand and Muddy Sand
ENV058	56.956	-1.263	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	1.22%	97.20%	1.58%	A5.2 Sand and Muddy Sand
ENV059	56.978	-1.337	Sandy Gravel	Very Fine Gravel	Very Poorly Sorted	59.33%	40.08%	0.58%	A5.1 Coarse Sediment

Sampling Station	Latitude	Longitude	Textural Group Classification	Folk Classification	Folk and Ward Sorting	Gravel (%)	Sand (%)	Mud (%)	BSH
ENV060	56.967	-1.300	Slightly Gravelly Sand	Medium Sand	Moderately Well Sorted	0.96%	97.30%	1.75%	A5.2 Sand and Muddy Sand
ENV061	57.001	-1.410	Slightly Gravelly Sand	Fine Sand	Moderately Sorted	4.16%	91.69%	4.15%	A5.2 Sand and Muddy Sand
ENV062	56.998	-1.443	Slightly Gravelly Sand	Fine Sand	Moderately Sorted	2.42%	91.78%	5.80%	A5.2 Sand and Muddy Sand
ENV063	56.986	-1.406	Slightly Gravelly Sand	Medium Sand	Poorly Sorted	3.80%	92.67%	3.53%	A5.2 Sand and Muddy Sand
ENV064	56.975	-1.369	Slightly Gravelly Sand	Medium Sand	Poorly Sorted	4.00%	92.81%	3.20%	A5.2 Sand and Muddy Sand
ENV065	56.964	-1.332	Slightly Gravelly Sand	Medium Sand	Moderately Well Sorted	1.58%	95.28%	3.14%	A5.2 Sand and Muddy Sand
ENV066	56.956	-1.263	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	0.45%	96.06%	3.49%	A5.2 Sand and Muddy Sand
ENV067	56.942	-1.259	Gravelly Sand	Medium Sand	Poorly Sorted	15.21%	79.83%	4.97%	A5.1 Coarse Sediment
ENV068	56.939	-1.291	Slightly Gravelly Muddy Sand	Medium Sand	Poorly Sorted	3.58%	85.81%	10.60%	A5.2 Sand and Muddy Sand
ENV069	56.950	-1.328	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	1.65%	94.23%	4.12%	A5.2 Sand and Muddy Sand

Sampling Station	Latitude	Longitude	Textural Group Classification	Folk Classification	Folk and Ward Sorting	Gravel (%)	Sand (%)	Mud (%)	BSH
ENV070	56.961	-1.365	Slightly Gravelly Sand	Medium Sand	Poorly Sorted	2.96%	89.33%	7.70%	A5.2 Sand and Muddy Sand
ENV071	56.972	-1.401	Gravelly Sand	Medium Sand	Poorly Sorted	5.80%	89.52%	4.68%	A5.1 Coarse Sediment
ENV072	56.986	-1.406	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	1.37%	96.34%	2.29%	A5.2 Sand and Muddy Sand
ENV074	56.983	-1.438	Gravelly Sand	Medium Sand	Poorly Sorted	6.97%	89.36%	3.66%	A5.1 Coarse Sediment
ENV075	56.958	-1.397	Slightly Gravelly Sand	Fine Sand	Moderately Sorted	2.20%	93.94%	3.86%	A5.2 Sand and Muddy Sand
ENV076	56.950	-1.328	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	1.46%	94.31%	4.23%	A5.2 Sand and Muddy Sand
ENV078	56.925	-1.287	Gravelly Sand	Medium Sand	Poorly Sorted	5.61%	91.70%	2.69%	A5.1 Coarse Sediment
ENV079	56.921	-1.319	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	1.37%	94.87%	3.75%	A5.2 Sand and Muddy Sand
ENV080	56.933	-1.356	Gravelly Sand	Medium Sand	Poorly Sorted	6.42%	90.34%	3.24%	A5.1 Coarse Sediment
ENV081	56.944	-1.393	Gravelly Sand	Coarse Sand	Poorly Sorted	7.50%	90.74%	1.76%	A5.1 Coarse Sediment
ENV082	56.955	-1.429	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	2.67%	93.01%	4.32%	A5.2 Sand and Muddy Sand

Sampling Station	Latitude	Longitude	Textural Group Classification	Folk Classification	Folk and Ward Sorting	Gravel (%)	Sand (%)	Mud (%)	BSH
ENV083	56.966	-1.466	Slightly Gravelly Sand	Fine Sand	Moderately Sorted	1.85%	94.81%	3.34%	A5.2 Sand and Muddy Sand
ENV084	56.941	-1.425	Slightly Gravelly Sand	Fine Sand	Moderately Sorted	0.46%	94.39%	5.15%	A5.2 Sand and Muddy Sand
ENV085	56.930	-1.388	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	1.16%	95.33%	3.51%	A5.2 Sand and Muddy Sand
ENV086	56.918	-1.351	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	4.73%	93.76%	1.52%	A5.2 Sand and Muddy Sand
ENV087	56.907	-1.315	Gravelly Sand	Coarse Sand	Poorly Sorted	17.04%	79.05%	3.92%	A5.1 Coarse Sediment
ENV088	56.904	-1.347	Slightly Gravelly Sand	Fine Sand	Moderately Sorted	1.51%	94.78%	3.71%	A5.2 Sand and Muddy Sand
ENV089	56.915	-1.384	Slightly Gravelly Sand	Medium Sand	Poorly Sorted	3.05%	89.45%	7.50%	A5.2 Sand and Muddy Sand
ENV090	56.927	-1.421	Slightly Gravelly Sand	Medium Sand	Poorly Sorted	1.69%	91.18%	7.13%	A5.2 Sand and Muddy Sand
ENV091	56.927	-1.421	Slightly Gravelly Sand	Medium Sand	Poorly Sorted	1.40%	92.15%	6.45%	A5.2 Sand and Muddy Sand
ENV092	56.924	-1.453	Gravelly Sand	Fine Sand	Poorly Sorted	6.86%	84.05%	9.09%	A5.1 Coarse Sediment

Sampling Station	Latitude	Longitude	Textural Group Classification	Folk Classification	Folk and Ward Sorting	Gravel (%)	Sand (%)	Mud (%)	BSH
ENV093	56.912	-1.416	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	4.31%	93.80%	1.89%	A5.2 Sand and Muddy Sand
ENV002	56.809	-2.260	Muddy Sand	Very Fine Sand	Poorly Sorted	0.00%	79.71%	20.29%	A5.3 Mud and Sandy Mud
ENV003	56.815	-2.230	Muddy Sandy Gravel	Very Coarse Sand	Very Poorly Sorted	58.42%	35.97%	5.62%	A5.4 Mixed Sediment
ENV004	56.821	-2.199	Slightly Gravelly Muddy Sand	Very Coarse Silt	Poorly Sorted	0.23%	47.88%	51.89%	A5.3 Mud and Sandy Mud
ENV005	56.827	-2.168	Sandy Mud	Very Coarse Silt	Poorly Sorted	0.00%	36.47%	63.53%	A5.3 Mud and Sandy Mud
ENV006	56.833	-2.137	Muddy Sandy Gravel	Very Coarse Sand	Very Poorly Sorted	35.76%	55.85%	8.39%	A5.4 Mixed Sediment
ENV007	56.840	-2.106	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	2.36%	95.70%	1.94%	A5.2 Sand and Muddy Sand
ENV008	56.846	-2.076	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	2.20%	95.20%	2.60%	A5.2 Sand and Muddy Sand
ENV009	56.852	-2.045	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	1.59%	96.93%	1.48%	A5.2 Sand and Muddy Sand
ENV010	56.858	-2.014	Gravelly Sand	Coarse Sand	Poorly Sorted	8.02%	90.74%	1.25%	A5.1 Coarse Sediment
ENV011	56.864	-1.983	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	1.92%	93.79%	4.29%	A5.2 Sand and Muddy Sand

Sampling Station	Latitude	Longitude	Textural Group Classification	Folk Classification	Folk and Ward Sorting	Gravel (%)	Sand (%)	Mud (%)	BSH
ENV012	56.870	-1.952	Slightly Gravelly Sand	Medium Sand	Moderately Well Sorted	1.00%	95.94%	3.05%	A5.2 Sand and Muddy Sand
ENV013	56.876	-1.922	Gravelly Muddy Sand	Fine Sand	Very Poorly Sorted	18.66%	43.77%	37.58%	A5.4 Mixed Sediment
ENV014	56.888	-1.860	Slightly Gravelly Muddy Sand	Fine Sand	Poorly Sorted	1.11%	80.31%	18.58%	A5.2 Sand and Muddy Sand
ENV015	56.882	-1.891	Slightly Gravelly Muddy Sand	Fine Sand	Poorly Sorted	2.41%	79.97%	17.62%	A5.2 Sand and Muddy Sand
ENV016	56.900	-1.798	Slightly Gravelly Muddy Sand	Fine Sand	Poorly Sorted	2.08%	80.41%	17.50%	A5.2 Sand and Muddy Sand
ENV017	56.906	-1.767	Slightly Gravelly Sand	Medium Sand	Poorly Sorted	2.54%	88.14%	9.32%	A5.2 Sand and Muddy Sand
ENV018	56.912	-1.736	Slightly Gravelly Sand	Medium Sand	Moderately Sorted	0.45%	94.56%	5.00%	A5.2 Sand and Muddy Sand
ENV019	56.918	-1.705	Slightly Gravelly Muddy Sand	Very Fine Sand	Very Poorly Sorted	2.97%	74.67%	22.36%	A5.3 Mud and Sandy Mud
ENV020	56.924	-1.674	Slightly Gravelly Sand	Medium Sand	Poorly Sorted	3.92%	86.66%	9.42%	A5.2 Sand and Muddy Sand
ENV021	56.930	-1.643	Gravelly Sand	Medium Sand	Poorly Sorted	5.98%	88.07%	5.94%	A5.1 Coarse Sediment
ENV022	56.936	-1.612	Gravelly Sand	Medium Sand	Poorly Sorted	6.00%	87.19%	6.82%	A5.1 Coarse Sediment

Sampling Station	Latitude	Longitude	Textural Group Classification	Folk Classification	Folk and Ward Sorting	Gravel (%)	Sand (%)	Mud (%)	BSH
ENV023	56.942	-1.581	Gravelly Muddy Sand	Medium Sand	Very Poorly Sorted	7.24%	80.02%	12.74%	A5.4 Mixed Sediment
ENV024	56.948	-1.550	Gravelly Sand	Medium Sand	Poorly Sorted	5.86%	86.26%	7.87%	A5.1 Coarse Sediment
ENV025	56.955	-1.519	Slightly Gravelly Sand	Medium Sand	Poorly Sorted	0.58%	93.66%	5.75%	A5.2 Sand and Muddy Sand
ENV026	56.960	-1.491	Slightly Gravelly Sand	Medium Sand	Poorly Sorted	2.37%	91.88%	5.75%	A5.2 Sand and Muddy Sand
ENV027	56.961	-1.365	Gravelly Sand	Fine Sand	Poorly Sorted	7.90%	84.76%	7.33%	A5.1 Coarse Sediment

ANNEX B. TOC AND TOM RESULTS FOR THE BENTHIC SUBTIDAL SURVEY

Sampling Station	Latitude	Longitude	TOC % m/m	TOM % m/m
ENV027	56.961	-1.365	0.10	1.2
ENV029	57.049	-1.359	0.06	0.8
ENV031	57.027	-1.285	0.15	2.0
ENV033	57.004	-1.212	0.12	1.9
ENV035	56.990	-1.207	0.10	1.1
ENV037	57.013	-1.280	0.14	2.1
ENV039	57.035	-1.354	0.06	0.9
ENV041	57.032	-1.387	0.10	1.2
ENV043	57.010	-1.313	0.14	1.4
ENV045	56.987	-1.239	0.08	1.1
ENV047	56.973	-1.235	0.14	1.7
ENV049	56.996	-1.309	0.07	1.6
ENV051	57.018	-1.382	0.12	1.3
ENV053	57.004	-1.378	0.12	1.1
ENV055	56.981	-1.305	0.08	1.1
ENV057	56.959	-1.230	0.06	0.9
ENV059	56.978	-1.337	0.06	0.9
ENV061	57.001	-1.410	0.09	1.0

Sampling Station	Latitude	Longitude	TOC % m/m	TOM % m/m
ENV063	56.986	-1.406	0.11	1.6
ENV065	56.964	-1.332	0.10	1.0
ENV067	56.942	-1.259	0.10	1.1
ENV069	56.950	-1.328	0.10	1.2
ENV071	56.972	-1.401	0.16	1.4
ENV073	56.984	-1.438	0.21	1.3
ENV075	56.958	-1.397	0.14	1.3
ENV077	56.947	-1.360	0.13	1.2
ENV079	56.921	-1.319	0.10	1.1
ENV081	56.944	-1.393	0.16	1.5
ENV083	56.966	-1.466	0.16	1.1
ENV085	56.930	-1.388	0.18	1.3
ENV087	56.907	-1.315	0.10	1.1
ENV089	56.915	-1.384	0.16	1.3
ENV091	56.927	-1.421	0.16	1.4
ENV093	56.912	-1.416	0.18	1.2
ENV003	56.815	-2.230	0.30	2.6
ENV005	56.827	-2.168	2.83	12.5
ENV007	56.840	-2.106	0.16	1.4

Sampling Station	Latitude	Longitude	TOC % m/m	TOM % m/m
ENV009	56.852	-2.045	0.22	1.8
ENV011	56.864	-1.983	0.23	1.5
ENV013	56.876	-1.922	0.16	1.5
ENV015	56.882	-1.891	0.22	1.7
ENV017	56.906	-1.767	0.18	1.5
ENV019	56.918	-1.705	0.35	1.8
ENV021	56.930	-1.643	0.19	1.5
ENV023	56.942	-1.581	0.14	1.6
ENV025	56.955	-1.519	0.12	1.1

ANNEX C. METAL RESULTS FOR THE BENTHIC SUBTIDAL SURVEY

Note: Cells are shaded when they exceed the relevant highlighted threshold

Sampling Station	Latitude	Longitude	Arsenic	Mercury	Cadmium	Chromium	Copper	Nickel	Lead	Zinc
Unit			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
MS AL1			20	0.25	0.4	50	30	30	50	130
MS AL2			70	1.5	4	370	300	150	400	600
CSQG TEL			7.24	0.13	0.7	52.3	18.7	-	30.2	124
CSQG PEL			41.6	0.7	4.2	160	108	-	112	271
ENV027	56.96118	-1.3646	8.5	<0.01	<0.03	15.9	2.5	4.1	8.9	14
ENV029	57.04936	-1.3586	14.5	<0.01	0.03	19.2	3.8	7.1	9.2	17
ENV031	57.02693	-1.285	12.9	<0.01	0.04	11.6	2.1	5.9	7.8	14
ENV033	57.00442	-1.2117	23.5	<0.01	0.05	15.8	8.2	11	12.1	41
ENV035	56.99012	-1.2073	9.4	<0.01	0.04	22.9	2.2	4.5	8.8	14
ENV037	57.01282	-1.2805	12.4	<0.01	0.04	9.4	2.3	5.7	8.5	16
ENV039	57.03518	-1.3541	20.7	<0.01	<0.03	13	3.3	4.9	8.6	16
ENV041	57.03221	-1.3868	14.3	<0.01	<0.03	18.3	2.1	4.7	9.8	16
ENV043	57.00977	-1.3132	11.8	<0.01	0.04	11.6	3.3	6.8	8	26
ENV045	56.98725	-1.2395	8.3	<0.01	<0.03	16.4	2	4.1	7.8	12
ENV047	56.97311	-1.2352	14.4	<0.01	0.04	10.8	2.2	4.7	8.1	12
ENV049	56.99559	-1.3087	18.3	<0.01	0.04	15.1	2.1	9.2	7.9	15
ENV051	57.01789	-1.3821	12.1	0.03	<0.03	19.3	2.3	4.5	10.9	16

Sampling Station	Latitude	Longitude	Arsenic	Mercury	Cadmium	Chromium	Copper	Nickel	Lead	Zinc
ENV053	57.00364	-1.3779	8.6	0.02	<0.03	15.1	1.9	3.7	8.1	12
ENV055	56.98121	-1.3046	14.1	0.01	<0.03	14.5	2.9	5.9	8.9	15
ENV057	56.95914	-1.2305	10.7	0.02	<0.03	13	2.7	5.4	9.8	14
ENV059	56.97824	-1.3368	19.1	0.02	0.05	28	5	12.7	8.4	37
ENV061	57.00088	-1.4102	6.4	0.01	<0.03	15.6	2.4	4.1	7.8	13
ENV063	56.9862	-1.4057	17.1	<0.01	<0.03	14.9	2	4.9	10.2	16
ENV065	56.96417	-1.3322	8.7	0.04	<0.03	15.2	2.2	3.7	8.1	13
ENV067	56.94183	-1.259	10.5	0.02	<0.03	15.8	2.7	4.3	8.4	13
ENV069	56.95001	-1.3278	7.1	0.02	<0.03	12.5	2.4	4	7.4	11
ENV071	56.97226	-1.4013	10.5	0.02	<0.03	15	2.6	4.3	9.1	13
ENV073	56.984	-1.438	8	0.01	<0.03	16.6	2.4	4.3	9.4	15
ENV075	56.95815	-1.3971	6.6	<0.01	<0.03	15.1	2.2	4.1	7.7	12
ENV077	56.947	-1.360	9	<0.01	0.03	19.4	2.7	4.9	9.6	16
ENV079	56.92144	-1.3192	10.2	<0.01	<0.03	16.2	2.3	3.9	8.6	13
ENV081	56.94382	-1.3925	19.9	<0.01	<0.03	14.4	2.3	7.2	10	15
ENV083	56.96639	-1.4658	9.4	<0.01	<0.03	16.3	2.2	3.8	8.8	12
ENV085	56.92963	-1.3882	5.2	<0.01	<0.03	18.4	2.2	3.9	6.9	12
ENV087	56.90725	-1.3149	15.8	<0.01	0.04	20	3	6.3	9.7	16
ENV089	56.91549	-1.3838	11.8	<0.01	<0.03	14.6	2.1	4.3	7.9	13
ENV091	56.92673	-1.4205	10.4	<0.01	<0.03	16.8	2.5	5	9.2	15

Sampling Station	Latitude	Longitude	Arsenic	Mercury	Cadmium	Chromium	Copper	Nickel	Lead	Zinc
ENV093	56.91249	-1.416	19.6	<0.01	<0.03	14.3	3	9.9	10.2	18
ENV003	56.81516	-2.2296	16.9	0.06	0.07	46.4	10	18.3	15	38
ENV005	56.82738	-2.1679	13.2	0.1	0.16	74.2	15.4	28.3	31.8	79
ENV007	56.83954	-2.1063	10.8	0.03	<0.03	18.7	3.7	7.4	10.1	18
ENV009	56.85163	-2.0445	9.9	0.02	0.04	17.3	3.7	7.8	10.5	17
ENV011	56.86372	-1.9829	7.5	0.12	0.06	29.1	6.1	11.8	14.4	24
ENV013	56.87583	-1.9216	10.1	0.1	0.05	25.5	6.5	10.5	13.2	23
ENV015	56.88173	-1.8907	9.7	0.09	0.05	29.8	10.1	13.9	14.4	30
ENV017	56.90619	-1.767	9	0.09	0.05	27.6	15.2	14.4	11	28
ENV019	56.91828	-1.7051	6.1	0.1	0.04	23.7	17.9	13.7	10.2	21
ENV021	56.93017	-1.6433	16.8	0.08	0.04	18.4	18.5	14.9	14.2	19
ENV023	56.94233	-1.5814	10.2	0.09	<0.03	23	17.6	14.1	13	20
ENV025	56.95463	-1.5193	27.8	0.08	0.03	22	18.1	21.4	15	23

ANNEX D. PCB RESULTS FOR THE BENTHIC SUBTIDAL SURVEY

Note: NQ = Not Quantifiable

Sampling Station	**Latitude**	**Longitude**	**PCB28**	**PCB52**	**PCB101**	**PCB118**	**PCB138**	**PCB153**	**PCB180**	**Total ICES-7 PCBs**
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Marine Scotland AL1			-	-	-	-	-	-	-	10
Marine Scotland AL2			-	-	-	-	-	-	-	1000
ENV027	56.961	-1.36458	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV029	57.049	-1.35862	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV031	57.027	-1.28503	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV033	57.004	-1.21174	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV035	56.99	-1.20733	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV037	57.013	-1.28049	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV039	57.035	-1.35414	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV041	57.032	-1.38676	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV043	57.01	-1.31324	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV045	56.987	-1.23949	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV047	56.973	-1.23519	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV049	56.996	-1.30875	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV051	57.018	-1.3821	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ

Sampling Station	Latitude	Longitude	PCB28	PCB52	PCB101	PCB118	PCB138	PCB153	PCB180	Total ICES-7 PCBs
ENV053	57.004	-1.3779	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV055	56.981	-1.30459	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV057	56.959	-1.23046	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV059	56.978	-1.33678	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV061	57.001	-1.41024	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV063	56.986	-1.40567	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV065	56.964	-1.33225	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV067	56.942	-1.25903	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV069	56.95	-1.32778	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV071	56.972	-1.40125	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV073	56.984	-1.438	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV075	56.958	-1.39712	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV077	56.947	-1.360	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV079	56.921	-1.31924	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV081	56.944	-1.39253	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV083	56.966	-1.46581	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV085	56.93	-1.3882	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV087	56.907	-1.31488	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV089	56.915	-1.38385	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ

Sampling Station	Latitude	Longitude	PCB28	PCB52	PCB101	PCB118	PCB138	PCB153	PCB180	Total ICES-7 PCBs
ENV091	56.927	-1.42053	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV093	56.912	-1.41605	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV003	56.815	-2.22963	0.00011	0.00019	0.00039	0.00049	0.00054	0.0005	0.00056	0.00278
ENV005	56.827	-2.16787	0.00016	0.00009	0.00016	0.00015	0.00022	0.00025	0.00011	0.00114
ENV007	56.84	-2.10633	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV009	56.852	-2.04452	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV011	56.864	-1.98285	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV013	56.876	-1.92158	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV015	56.882	-1.89069	0.00009	0.00014	0.00019	0.00023	0.00015	0.00017	0.00026	0.00123
ENV017	56.906	-1.76698	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV019	56.918	-1.7051	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV021	56.93	-1.64331	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV023	56.942	-1.58135	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ
ENV025	56.955	-1.51934	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	NQ

ANNEX E. PAH RESULTS FOR THE BENTHIC SUBTIDAL SURVEY

Sampling Station	Latitude	Longitude	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzoanthracene	Chrysene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzopyrene	Indenopyrene	Dibenzoanthracene	Benzoperylene
Unit			ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
MS AL1			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20
MS AL2			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	180
ENV027	56.96118	-1.3646	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2.06	<1	1.96
ENV029	57.04936	-1.3586	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV031	57.02693	-1.285	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV033	57.00442	-1.2117	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV035	56.99012	-1.2073	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV037	57.01282	-1.2805	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV039	57.03518	-1.3541	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV041	57.03221	-1.3868	1.31	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV043	57.00977	-1.3132	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV045	56.98725	-1.2395	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV047	56.97311	-1.2352	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV049	56.99559	-1.3087	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Sampling Station	Latitude	Longitude	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzoanthracene	Chrysene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzopyrene	Indenopyrene	Dibenzoanthracene	Benzoperylene
ENV051	57.01789	-1.3821	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.56	<1	<1
ENV053	57.00364	-1.3779	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV055	56.98121	-1.3046	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV057	56.95914	-1.2305	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV059	56.97824	-1.3368	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV061	57.00088	-1.4102	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV063	56.9862	-1.4057	1.61	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV065	56.96417	-1.3322	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV067	56.94183	-1.259	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV069	56.95001	-1.3278	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV071	56.97226	-1.4013	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV073	56.984	-1.438	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV075	56.95815	-1.3971	1.45	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.56	<1	<1	1.94	<1	1.71
ENV077	56.947	-1.360	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV079	56.92144	-1.3192	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV081	56.94382	-1.3925	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Sampling Station	Latitude	Longitude	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzoanthracene	Chrysene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzopyrene	Indenopyrene	Dibenzoanthracene	Benzoperylene
ENV083	56.9664	-1.4658	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV085	56.92963	-1.3882	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV087	56.90725	-1.3149	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV089	56.91549	-1.3838	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV091	56.92673	-1.4205	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.59	<1	1.41
ENV093	56.91249	-1.416	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV003	56.81516	-2.2296	10.4	3.13	2.54	3.96	20.6	6.81	37.8	37.1	22.4	24.8	46.5	38.3	35.9	43.6	6.45	39.5
ENV005	56.82738	-2.1679	20.3	8.59	5.47	10.1	47	13.9	97.9	87.6	69.9	69	120	97.1	107	160	25.1	151
ENV007	56.83954	-2.1063	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.15	<1	<1
ENV009	56.85163	-2.0445	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV011	56.86372	-1.9829	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.14	1.26	<1	1.78	<1	1.73
ENV013	56.87583	-1.9216	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.37	1.01	<1	1.87	<1	1.57
ENV015	56.88173	-1.8907	<1	<1	<1	<1	<1	<1	1	<1	<1	1.07	2.1	2.2	<1	3.11	<1	2.83
ENV017	56.90619	-1.767	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.84	1.59	<1	2.78	<1	2.81
ENV019	56.91828	-1.7051	<1	<1	<1	<1	1.18	<1	1.69	1.54	<1	1.27	3.64	2.69	1.48	4.21	<1	4.2
ENV021	56.93017	-1.6433	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.69	<1	1.45

Sampling Station	Latitude	Longitude	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzoanthracene	Chrysene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzopyrene	Indenopyrene	Dibenzoanthracene	Benzoperylene
ENV023	56.94233	-1.5814	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ENV025	56.95463	-1.5193	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.61	<1	1.49

ANNEX F. BENTHIC INFAUNAL DATA

F1 Benthic Infaunal Contribution of Biomass to Gross Taxonomic Groups

Sampling Station	Annelida (biomass g)	Crustacea (biomass g)	Mollusca (biomass g)	Echinodermata (biomass g)	Other (biomass g)	Subtotal (g)
ENV028	0.2461	0.0027	0.1082	0.0169	0.08	0.4538
ENV029	0.2312	0.0001	0.0911	0.2618	0.002	0.5865
ENV030	0.1229	0.0258	0.3931	0.0229	0.006	0.5705
ENV031	0.4194	0.0237	27.3357	0.0539	0.112	27.9448
ENV032	0.5948	0.0124	333.603	0.053	0.007	334.2695
ENV033	0.1751	0.0132	0.2112	0.0123	0.019	0.4308
ENV034	0.0777	14.9714	0.2897	0.0141	0.023	15.3761
ENV035	0.1328	0.005	0.1024	0.0471	0.004	0.2915
ENV036	1.0271	0.5123	52.362	0.0194	0.052	53.9731
ENV037	0.2875	0.0047	231.721	0.0293	0.035	232.0778
ENV038	0.1935	0.0125	0.1332	0.037	0.008	0.3837
ENV039	0.1237	0.0531	0.906	0.0296	0.001	1.1135
ENV040	1.486	0.0169	0.2068	0.0229	0.055	1.7877
ENV041	0.0767	0.0062	0.1397	0.0764	0.001	0.3002
ENV042	0.0419	0.0095	0.0495	0.021	0.003	0.1246
ENV043	0.3221	0.004	0.6218	0.0873	0.025	1.0604
ENV044	0.2548	0.0274	60.6197	0.0882	0.026	61.0156

Sampling Station	Annelida (biomass g)	Crustacea (biomass g)	Mollusca (biomass g)	Echinodermata (biomass g)	Other (biomass g)	Subtotal (g)
ENV045	0.4234	0.0099	0.5204	0.1181	0.031	1.1023
ENV046	0.3378	0.0163	3.5349	0.3019	0.043	4.234
ENV047	0.3072	0.0131	0.0872	0.0206	0.01	0.4382
ENV048	0.6795	0.0126	0.1993	0.0487	1E-04	0.9402
ENV049	2.1036	0.0053	1.2279	0.0218	0.022	3.3801
ENV050	0.0519	0.0009	0.8277	0.0534	0.006	0.9394
ENV051	0.2222	0.0173	1.9682	0.042	0.022	2.2714
ENV052	0.2865	0.0121	0.0091	0.0516	0.001	0.3604
ENV053	0.521	0.0179	0.0845	0.1296	0.022	0.7753
ENV054	0.3045	0.014	0.056	0.0137	1E-04	0.3883
ENV055	0.0774	0.0025	0.0056	0.0032	0.038	0.1264
ENV056	0.443	0.0172	0.0286	0.0191	0.085	0.5933
ENV057	0.0416	0.008	0.3525	0.0153	0.003	0.4202
ENV058	0.1125	0.0061	3.8214	0.0582	0.014	4.0117
ENV059	0.1174	0.0243	0.0157	0.0038	0.012	0.173
ENV060	0.8789	0.0099	0.4203	0.0058	0.001	1.3159
ENV061	0.1725	0.0035	0.9285	0.3932	0.03	1.5276
ENV062	0.1954	0.0349	0.0061	0.0161	0.03	0.282
ENV063	0.2882	0.009	0.0225	0.0177	9E-04	0.3383
ENV064	0.1039	0.0054	0.0046	0.0375	0.014	0.1655

Sampling Station	Annelida (biomass g)	Crustacea (biomass g)	Mollusca (biomass g)	Echinodermata (biomass g)	Other (biomass g)	Subtotal (g)
ENV065	0.1779	0.0265	0.0046	0.0424	0.013	0.2646
ENV066	0.0321	0.0078	0.0649	0.0033	6E-04	0.1087
ENV067	0.0697	0.011	0.0233	0.1137	0.012	0.2292
ENV068	0.0747	0.002	1.3773	0.0301	0.021	1.5051
ENV069	0.2321	0.0188	1.6778	0.073	0.028	2.0301
ENV070	0.199	0.0036	1.1045	3.6342	0.003	4.9441
ENV071	0.6327	0.0067	1.6653	0.1571	0.059	2.5207
ENV072	0.3506	0.0086	0.0005	0.0257	0.001	0.3864
ENV074	0.1644	0.0064	0.3519	0.0286	0.006	0.5569
ENV075	0.4464	0.0112	0.1106	0.0373	0.011	0.6164
ENV076	0.1604	0.0008	9.159	0.0686	0.009	9.3977
ENV078	0.2816	0.0461	1.2279	0.1305	0.087	1.7732
ENV079	0.1903	0.018	0.7329	0.0106	0.014	0.9661
ENV080	0.3346	0.0156	0.9487	0.0477	1E-04	1.3467
ENV081	0.5828	0.0137	0.7126	0.2285	0.032	1.5691
ENV082	0.362	0.0114	6.7047	0.0954	0.018	7.1915
ENV083	0.0638	0.0005	0.0535	0.0239	0.003	0.1446
ENV084	2.0606	0.0153	0.0042	0.025	0.014	2.1188
ENV085	0.4527	0.0194	65.8749	0.0136	0.079	66.4393
ENV086	0.3024	0.0183	0.2552	0.0212	1E-04	0.5972

Sampling Station	Annelida (biomass g)	Crustacea (biomass g)	Mollusca (biomass g)	Echinodermata (biomass g)	Other (biomass g)	Subtotal (g)
ENV087	0.2227	0.0397	0.4018	0.0223	0.027	0.7132
ENV088	0.3592	0.0129	0.0508	0.0199	0.009	0.4517
ENV089	0.2867	0.0139	1.5264	0.0141	0.059	1.8999
ENV090	0.4302	0.0306	0.167	0.0771	0.007	0.7123
ENV091	0.246	0.0253	7.4505	0.013	0.065	7.8001
ENV092	1.6786	0.0295	0.741	0.0506	0.027	2.5268
ENV093	0.2867	0.0156	0.1101	0.0774	0.037	0.527
ENV002	0.0014	0.0004	0.1591	0.0008	0	0.1617
ENV003	0.0201	0.0013	0.0171	0.0066	0.009	0.0544
ENV004	1.2647	0.0067	0.3226	7.1123	0.039	8.7453
ENV005	0.4196	0.0075	0.0083	0.1166	0.038	0.59
ENV006	0.5707	0.0253	0.0582	0.0496	0.014	0.7181
ENV007	0.3534	0.0155	0.0274	0.0699	0.007	0.4732
ENV008	0.0254	0.0089	0.0077	0.0236	0.008	0.0737
ENV009	0.044	0.0283	0.0391	0.0604	0.003	0.1752
ENV010	0.0766	0.0001	0.0501	0.0104	0.004	0.1416
ENV011	0.0021	0.0006	0	0	1E-04	0.0028
ENV012	0.0829	0.0024	0.0228	0.0594	0.014	0.1818
ENV013	0.0805	0.0023	0.0168	0.0531	0.003	0.1558
ENV014	0.2474	0.0015	0.0036	0.3413	0.004	0.5973

Sampling Station	Annelida (biomass g)	Crustacea (biomass g)	Mollusca (biomass g)	Echinodermata (biomass g)	Other (biomass g)	Subtotal (g)
ENV015	0.5548	0.0013	0.3001	0.0509	0.002	0.9092
ENV016	0.9876	0.0057	0.0312	0.1779	0.003	1.205
ENV017	0.0055	0.0042	0.017	0.0109	0.526	0.5634
ENV018	0.3796	0.0075	0.4565	0.0654	1E-04	0.9091
ENV019	0.5462	0.0052	0.1941	0.1963	0.001	0.943
ENV020	0.6216	0.0039	26.96	0.0324	0.028	27.6457
ENV021	0.9847	0.0734	0.6952	0.0373	0.008	1.7984
ENV022	0.2984	0.0049	1.8941	0.0183	0.04	2.2552
ENV023	0.1766	0.0285	0.0057	0.0214	0.01	0.2426
ENV024	0.8863	0.0167	0.1256	0.0262	0.034	1.0885
ENV025	0.3383	0.0044	0.0208	0.0752	0.002	0.4402
ENV026	0.6387	0.0058	0.0041	0.0531	0.01	0.712
ENV027	0.1369	0.0195	0.3391	0.0311	0.01	0.5362

F2 Multivariate Analysis Results

Note: Where results are presented as #####, PRIMER was not able to complete this calculation due to the presence of too few stations within the group (minimum of 3 stations required for Sim/SD calculation).

Data worksheet					
Name: Data1					
Data type: Abundance					
Sample selection: All					
Variable selection: All					
Parameters					
Resemblance: S17 Bray Curtis similarity					
Cut off for low contributions: 90.00%					
Factor Groups					
Sample	Faunal Group				
ENV028	u				
ENV063	u				
ENV021	u				
ENV029	d				
ENV039	d				
ENV042	d				
ENV030	s				
ENV050	s				
ENV054	s				
ENV057	s				
ENV058	s				
ENV079	s				
ENV080	s				
ENV083	s				
ENV088	s				
ENV026	s				
ENV031	i				
ENV036	i				

Data worksheet					
ENV044	i				
ENV059	i				
ENV032	j				
ENV037	j				
ENV033	h				
ENV047	h				
ENV034	m				
ENV038	m				
ENV043	m				
ENV048	m				
ENV049	m				
ENV055	m				
ENV060	m				
ENV066	m				
ENV068	m				
ENV074	m				
ENV078	m				
ENV086	m				
ENV087	m				
ENV089	m				
ENV091	m				
ENV093	m				
ENV007	m				
ENV035	v				
ENV041	v				
ENV045	v				
ENV046	v				
ENV053	v				
ENV065	v				
ENV071	v				
ENV075	v				
ENV076	v				

Data worksheet					
ENV082	v				
ENV090	v				
ENV092	v				
ENV025	v				
ENV027	v				
ENV040	l				
ENV051	n				
ENV052	n				
ENV062	n				
ENV056	o				
ENV015	o				
ENV024	o				
ENV061	r				
ENV012	r				
ENV064	e				
ENV009	e				
ENV010	e				
ENV067	q				
ENV069	t				
ENV070	t				
ENV072	p				
ENV084	p				
ENV081	g				
ENV023	g				
ENV085	w				
ENV013	w				
ENV014	w				
ENV022	w				
ENV002	b				
ENV003	x				
ENV004	x				
ENV005	x				

Data worksheet					
ENV006	f				
ENV008	c				
ENV011	a				
ENV016	k				
ENV017	k				
ENV018	k				
ENV019	k				
ENV020	k				
Group u					
Average similarity: 50.87					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Echinocyamus pusillus	4.42	4.81	4.5	9.46	9.46
Parexogone hebes	4.03	4.25	5.7	8.35	17.81
Grania	3.37	3.39	2.89	6.67	24.48
Ophelia borealis	3.48	3.34	3.08	6.57	31.05
Amphiuridae_Juv	4.13	3.31	8.81	6.51	37.56
COPEPODA	3.01	3.2	3.17	6.29	43.85
***Glycera*_Juv**	2.9	3.06	22.09	6.02	49.87
***Ophelia*_Juv**	2.57	2.91	5.73	5.72	55.59
***Goniadidae*_Juv**	2.16	2.53	26.6	4.97	60.56
Aricidea (Acmira) cerrutii	1.99	2.22	8.79	4.37	64.93
NEMERTEA	2.64	2.19	3.2	4.3	69.23
Galathowenia oculata	2.62	1.45	0.58	2.85	72.08
Owenia	1.28	1.39	4.5	2.73	74.81
Eteone longa	1	1.22	12.73	2.4	77.2
Spiophanes bombyx	1.33	1.22	12.73	2.4	79.6
Notomastus	1.24	1.22	12.73	2.4	82
SIPUNCULA_Juv	1.33	0.75	0.58	1.47	83.47
Paradoneis lyra	1.35	0.58	0.58	1.13	84.61
THRACIOIDEA_Juv	1.67	0.58	0.58	1.13	85.74

Data worksheet					
Antalis entalis	1.05	0.53	0.58	1.04	86.78
Abra prismatica	0.94	0.53	0.58	1.04	87.82
Sthenelais limicola	0.8	0.44	0.58	0.86	88.68
Goniadella gracilis	0.8	0.44	0.58	0.86	89.54
Spiophanes kroyeri	0.67	0.44	0.58	0.86	90.4
Group d					
Average similarity: 38.18					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Parexogone hebes	2.23	6.35	20.95	16.63	16.63
Aricidea (Acmira) cerrutii	1.66	3.86	2.44	10.11	26.74
Echinocyamus pusillus	1.79	3.86	2.44	10.11	36.86
Asbjornsenia pygmaea	2.37	3.46	6.08	9.06	45.92
Dosinia_Juv	1	3.06	15.36	8.02	53.94
NEMERTEA	1.41	1.93	0.58	5.06	59
Nephtys_Juv	1.05	1.55	0.58	4.05	63.05
Ophelia borealis	1.05	1.55	0.58	4.05	67.1
Bathyporeia guilliamsoniana	1.58	1.55	0.58	4.05	71.16
Spio goniocephala	1.29	1.42	0.58	3.71	74.86
Nephtys cirrosa	1.05	1.37	0.58	3.58	78.44
Cochlodesma praetenue	0.94	1.37	0.58	3.58	82.02
Streptodonta pterochaeta	0.91	1	0.58	2.62	84.64
Pseudocuma (Pseudocuma) longicorne	0.67	1	0.58	2.62	87.26
Euspira nitida	0.8	1	0.58	2.62	89.88
Goniadella gracilis	0.67	0.97	0.58	2.53	92.41
Group s					
Average similarity: 50.76					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Echinocyamus pusillus	4.09	6.67	3.55	13.15	13.15

Data worksheet					
Amphiuridae_Juv	4.3	6.25	2.78	12.32	25.47
Parexogone hebes	2.92	4.11	2.35	8.09	33.56
Ophelia borealis	2.48	3.78	3.01	7.45	41
Nephtys_Juv	1.91	3.18	4.95	6.27	47.27
COPEPODA	2.04	3.01	2.91	5.93	53.2
NEMERTEA	1.71	2.73	4.23	5.37	58.57
Aricidea (Acmira) cerrutii	1.67	2.56	1.9	5.04	63.61
Bathyporeia elegans	1.5	2.07	1.72	4.07	67.68
Grania	1.69	1.89	1.1	3.72	71.4
Ophelia_Juv	1.52	1.45	1.09	2.85	74.26
THRACIOIDEA_Juv	1.24	1.31	0.86	2.58	76.84
Exogone verugera	1.21	1.07	0.88	2.1	78.94
Owenia	0.74	0.92	0.92	1.81	80.75
Edwardsiidae	0.74	0.89	0.92	1.76	82.51
Cochlodesma praetenue	1.11	0.89	0.65	1.75	84.25
Sthenelais limicola	0.68	0.68	0.69	1.34	85.59
Spiophanes bombyx	0.68	0.66	0.69	1.3	86.89
Chaetozone christiei	0.67	0.66	0.7	1.3	88.19
Lumbrineris cingulata	0.74	0.46	0.52	0.9	89.09
Abra_Juv	0.61	0.43	0.52	0.86	89.95
Branchiostoma lanceolatum	0.5	0.43	0.53	0.85	90.8
Group i					
Average similarity: 57.95					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Grania	6.91	4.29	5.68	7.4	7.4
Pisione remota	5.85	3.21	2.97	5.54	12.94
Glycera lapidum	4.99	2.98	7.92	5.14	18.08
Amphiuridae_Juv	4.98	2.87	2.67	4.96	23.04
Goniadella gracilis	5.03	2.8	5.15	4.84	27.88
Ophelia_Juv	4.46	2.18	1.61	3.75	31.63

Data worksheet					
NEMERTEA	3.59	2.16	7.06	3.73	35.36
Echinocyamus pusillus	3.64	2.11	4.02	3.64	38.99
COPEPODA	3.61	1.82	2.43	3.14	42.13
Polygordius	3.24	1.79	6.57	3.08	45.21
Aonides paucibranchiata	2.66	1.64	10.98	2.84	48.05
Syllis parapari	2.77	1.44	1.78	2.49	50.54
Eulalia mustela	2.53	1.43	6.19	2.47	53
Owenia	2.3	1.37	6.41	2.37	55.37
Aricidea (Acmira) cerrutii	2.33	1.35	3.44	2.33	57.7
Syllis pontxioi	2.15	1.16	5.19	2.01	59.71
Glycera_Juv	2.41	1.13	3.47	1.95	61.66
Parexogone hebes	1.78	1.09	10.78	1.87	63.53
Phascolion (Phascolion) strombus strombus	1.75	1.01	10.21	1.75	65.28
Sphaerosyllis bulbosa	1.97	0.95	2.6	1.64	66.92
Psamathe fusca	1.62	0.94	3.54	1.62	68.54
Streptosyllis bidentata	2.49	0.85	0.91	1.47	70.01
Pseudomystides limbata	1.94	0.84	2.46	1.46	71.47
Guernea (Guernea) coalita	1.71	0.8	3.3	1.38	72.85
Nototropis vedlomensis	1.29	0.75	4.41	1.29	74.14
Pista	1.41	0.74	5.1	1.28	75.42
Mytilidae_Juv	1.83	0.69	0.91	1.19	76.61
Ophelia borealis	1.72	0.65	0.85	1.13	77.73
Hesionura elongata	1.95	0.61	0.66	1.05	78.79
Nephasoma (Nephasoma) minutum	1.8	0.59	0.91	1.01	79.8
Notomastus	1.47	0.5	0.78	0.87	80.67
THRACIOIDEA_Juv	1.06	0.49	0.91	0.84	81.51
Sphaerosyllis hystrix	1.27	0.48	0.91	0.83	82.33
Spisula_Juv	1.47	0.46	0.8	0.8	83.14
Asbjornsenia pygmaea	1.24	0.46	0.84	0.8	83.94
Edwardsiidae	1.31	0.45	0.84	0.78	84.71
Pholoe baltica	1.5	0.45	0.84	0.78	85.49
Eteone longa	1.31	0.45	0.82	0.77	86.27

Data worksheet					
Glycymeris glycymeris	1.25	0.44	0.84	0.77	87.03
Polycirrus	1.3	0.41	0.86	0.71	87.74
Embletonia pulchra	1.12	0.41	0.86	0.71	88.45
Parathelepus collaris	1.04	0.38	0.89	0.66	89.11
Pseudosyllis brevipennis	1.1	0.38	0.9	0.65	89.76
Spiophanes kroyeri	0.75	0.34	0.91	0.59	90.35
Group j					
Average similarity: 55.74					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Pisione remota	6.11	4.04	#######	7.24	7.24
Polygordius	5.23	3.5	#######	6.27	13.51
Amphiuridae_Juv	4.39	2.76	#######	4.96	18.47
Sphaerosyllis bulbosa	3.72	2.37	#######	4.25	22.72
Glycera lapidum	3.38	2.26	#######	4.05	26.76
Echinocyamus pusillus	3.16	2.14	#######	3.84	30.61
Aonides paucibranchiata	2.91	2.02	#######	3.62	34.23
Glycymeris glycymeris	3.22	2.02	#######	3.62	37.85
Eulalia mustela	3.19	1.89	#######	3.39	41.23
Mytilidae_Juv	4.89	1.89	#######	3.39	44.62
NEMERTEA	2.85	1.6	#######	2.86	47.48
Pseudosyllis brevipennis	2	1.43	#######	2.56	50.04
COPEPODA	2.32	1.43	#######	2.56	52.6
Psamathe fusca	2.52	1.24	#######	2.22	54.82
Syllis pontxioi	2.28	1.24	#######	2.22	57.04
Polycirrus	1.87	1.24	#######	2.22	59.26
Dialychone dunerificta	1.98	1.24	#######	2.22	61.47
Grania	2.99	1.24	#######	2.22	63.69
Caecum glabrum	3.78	1.24	#######	2.22	65.91
Asbjornsenia pygmaea	2.8	1.24	#######	2.22	68.12
Malmgrenia ljungmani	1.41	1.01	#######	1.81	69.94

Data worksheet					
Pholoe baltica	1.71	1.01	#######	1.81	71.75
Pseudomystides limbata	1.93	1.01	#######	1.81	73.56
Goniadella gracilis	1.71	1.01	#######	1.81	75.37
Crenella decussata	1.93	1.01	#######	1.81	77.18
***Spisula*_Juv**	1.83	1.01	#######	1.81	78.99
THRACIOIDEA_Juv	1.57	1.01	#######	1.81	80.8
Sphaerosyllis hystrix	1.5	0.71	#######	1.28	82.08
Macrochaeta	1	0.71	#######	1.28	83.36
Notomastus	1.37	0.71	#######	1.28	84.64
Pseudonotomastus southerni	1.5	0.71	#######	1.28	85.92
***Ophelia*_Juv**	1	0.71	#######	1.28	87.2
Protodrilus	1	0.71	#######	1.28	88.48
Phisidia aurea	1.21	0.71	#######	1.28	89.76
Nototropis vedlomensis	1	0.71	#######	1.28	91.04
Group h					
Average similarity: 50.80					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
***Glycera*_Juv**	5.32	3.59	#######	7.07	7.07
Echinocyamus pusillus	5.48	3.52	#######	6.92	13.99
***Goniadidae*_Juv**	4.85	3.44	#######	6.77	20.76
NEMERTEA	4.74	3.28	#######	6.45	27.22
***Ophelia*_Juv**	6.86	3.11	#######	6.12	33.34
***Amphiuridae*_Juv**	6.76	2.43	#######	4.79	38.13
Aonides paucibranchiata	3.15	2.07	#######	4.08	42.21
Guernea (Guernea) coalita	3	2.07	#######	4.08	46.29
Eulalia mustela	2.65	1.94	#######	3.82	50.11
Polycirrus	2.9	1.94	#######	3.82	53.93
Asbjornsenia pygmaea	2.96	1.8	#######	3.54	57.46
Pholoe baltica	2.7	1.64	#######	3.23	60.69
***Abra*_Juv**	2.53	1.64	#######	3.23	63.92

Data worksheet					
Streptosyllis bidentata	2.87	1.47	#######	2.89	66.81
Grania	3.4	1.47	#######	2.89	69.69
Glycera lapidum	2.09	1.27	#######	2.5	72.19
Syllis parapari	1.73	1.27	#######	2.5	74.69
Ophelia borealis	1.73	1.27	#######	2.5	77.19
COPEPODA	4.11	1.27	#######	2.5	79.69
Edwardsiidae	1.41	1.04	#######	2.04	81.73
SIPUNCULA_Juv	2.21	1.04	#######	2.04	83.77
Parexogone hebes	3.49	1.04	#######	2.04	85.81
Aricidea (Acmira) simonae	1.41	1.04	#######	2.04	87.86
Mytilidae_Juv	1.93	1.04	#######	2.04	89.9
Hesionura elongata	1.21	0.73	#######	1.44	91.34
Group m					
Average similarity: 44.33					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Echinocyamus pusillus	4.5	5.84	4.98	13.17	13.17
Parexogone hebes	2.91	3.66	3.17	8.26	21.42
Grania	2.77	2.73	1.89	6.15	27.58
Ophelia_Juv	2.21	2.7	3.42	6.09	33.67
COPEPODA	2.44	2.45	1.74	5.53	39.19
NEMERTEA	1.84	2.22	3.28	5.01	44.21
Amphiuridae_Juv	2.34	1.98	1.15	4.48	48.68
Asbjornsenia pygmaea	1.93	1.59	1.11	3.59	52.27
Aricidea (Acmira) cerrutii	1.7	1.46	1.08	3.29	55.57
Glycera lapidum	1.87	1.43	0.96	3.23	58.79
Goniadella gracilis	2.05	1.35	0.97	3.05	61.84
Goniadidae_Juv	1.75	1.31	0.86	2.95	64.79
Ophelia borealis	1.27	0.95	0.75	2.14	66.93
Ophiuridae_Juv	1.75	0.9	0.54	2.04	68.97
Sphaerosyllis hystrix	0.8	0.8	0.95	1.79	70.76

Data worksheet					
Aonides paucibranchiata	1.15	0.75	0.74	1.69	72.45
Cochlodesma praetenue	0.82	0.74	0.94	1.67	74.11
THRACIOIDEA_Juv	1.04	0.67	0.66	1.5	75.62
***Glycera*_Juv**	1.09	0.66	0.57	1.49	77.1
Hesionura elongata	1.18	0.66	0.56	1.49	78.59
***Spisula*_Juv**	0.96	0.63	0.68	1.43	80.01
Edwardsiidae	0.9	0.58	0.67	1.3	81.31
***Nephtys*_Juv**	0.85	0.55	0.68	1.23	82.55
Lumbrineris cingulata	0.72	0.51	0.68	1.15	83.69
Pisione remota	1.03	0.43	0.47	0.97	84.67
Streptosyllis bidentata	0.83	0.35	0.41	0.8	85.47
Pseudonotomastus southerni	0.74	0.32	0.39	0.72	86.18
Glycinde nordmanni	0.59	0.32	0.5	0.72	86.9
Spiophanes bombyx	0.52	0.31	0.5	0.69	87.59
Galathowenia oculata	0.52	0.3	0.5	0.68	88.27
Scoloplos armiger	0.57	0.3	0.5	0.67	88.94
Owenia	0.5	0.25	0.42	0.57	89.51
***Dosinia*_Juv**	0.5	0.25	0.42	0.57	90.08
Group v					
Average similarity: 52.96					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Amphiuridae_Juv	6	5.95	4.74	11.23	11.23
Echinocyamus pusillus	5.6	5.85	7.43	11.05	22.28
COPEPODA	3.93	3.62	4.08	6.84	29.12
Parexogone hebes	3.57	3.3	3.47	6.22	35.35
Ophelia borealis	2.94	3.03	5.19	5.72	41.07
Exogone verugera	2.23	2.19	3.44	4.13	45.2
NEMERTEA	2.15	2.15	5.13	4.06	49.27
Grania	2.44	1.74	1.51	3.28	52.55
Lumbrineris cingulata	2.2	1.61	1.41	3.04	55.59

Data worksheet					
THRACIOIDEA_Juv	1.8	1.51	1.52	2.86	58.45
***Glycera*_Juv**	1.96	1.45	1.16	2.74	61.19
***Ophelia*_Juv**	1.9	1.43	1.26	2.69	63.89
***Nephtys*_Juv**	1.45	1.37	2	2.6	66.48
Aonides paucibranchiata	1.2	1.11	2.15	2.09	68.58
Aricidea (Acmira) cerrutii	1.54	1.11	1.11	2.09	70.66
Pholoe baltica	1.36	1.05	1.45	1.97	72.64
Paradoneis lyra	1.43	1.04	1.17	1.97	74.61
Chaetozone christiei	1.57	1	0.91	1.89	76.5
Scoloplos armiger	1.31	0.85	0.92	1.6	78.1
Galathowenia oculata	1.13	0.74	0.92	1.4	79.5
Bathyporeia elegans	0.99	0.68	0.94	1.29	80.79
Owenia	0.92	0.56	0.77	1.07	81.85
Amphiura filiformis	0.78	0.49	0.77	0.92	82.77
Streptosyllis websteri	0.98	0.45	0.63	0.85	83.63
Spiophanes bombyx	0.85	0.45	0.62	0.84	84.47
Glycera lapidum	0.99	0.44	0.62	0.84	85.31
Peresiella clymenoides	0.95	0.39	0.65	0.74	86.04
Edwardsiidae	0.75	0.37	0.63	0.7	86.75
Kurtiella bidentata	0.95	0.35	0.53	0.65	87.4
***Abra*_Juv**	0.68	0.34	0.65	0.65	88.05
Hippomedon denticulatus	0.63	0.34	0.65	0.64	88.69
Sthenelais limicola	0.6	0.34	0.66	0.64	89.32
Mediomastus fragilis	0.75	0.33	0.53	0.62	89.95
Notomastus	0.68	0.29	0.52	0.55	90.5
Group l					
Less than 2 samples in group					
Group n					
Average similarity: 52.51					

Data worksheet					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Amphiuridae_Juv	6.32	6.35	12.31	12.09	12.09
COPEPODA	5.49	5.24	11.91	9.98	22.07
Lumbrineris cingulata	3.1	3.33	18.4	6.34	28.41
Echinocyamus pusillus	3.12	2.85	3.77	5.44	33.85
Galathowenia oculata	2.85	2.85	11.47	5.43	39.28
Pholoe baltica	2.51	2.31	3.97	4.39	43.67
Ophelia_Juv	1.63	1.72	7.69	3.28	46.96
THRACIOIDEA_Juv	1.72	1.72	7.69	3.28	50.24
Peresiella clymenoides	2.46	1.71	1.85	3.26	53.5
NEMERTEA	2.3	1.64	2.03	3.13	56.63
Bathyporeia elegans	1.61	1.61	11.62	3.06	59.68
Paradoneis lyra	2.08	1.59	2.04	3.04	62.72
Scoloplos armiger	1.58	1.44	2.33	2.74	65.46
Nephtys_Juv	1.14	1.14	11.62	2.16	67.62
Spiophanes bombyx	1	1.14	11.62	2.16	69.78
Magelona alleni	1.33	1.14	11.62	2.16	71.95
Diplocirrus glaucus	1.24	1.14	11.62	2.16	74.11
Owenia	1.33	1.14	11.62	2.16	76.27
PODOCOPIDA	1.24	1.14	11.62	2.16	78.43
Harpinia antennaria	1.41	1.14	11.62	2.16	80.59
Tanaopsis graciloides	1.41	1.14	11.62	2.16	82.76
Ophelia borealis	1.69	0.93	0.58	1.76	84.52
Lanice conchilega	1.33	0.7	0.58	1.33	85.85
Perioculodes longimanus	1.32	0.64	0.58	1.22	87.08
Urothoe elegans	1.14	0.53	0.58	1	88.08
Cylichna cylindracea	1.14	0.53	0.58	1	89.08
Parexogone hebes	1.22	0.49	0.58	0.94	90.02
Group o					
Average similarity: 47.51					

Data worksheet					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Echinocyamus pusillus	3.91	2.63	6.51	5.54	5.54
Lumbrineris cingulata	5.44	2.53	1.99	5.33	10.87
Amphiuridae_Juv	4.63	2.15	3.81	4.52	15.39
Peresiella clymenoides	3.61	2.1	4.3	4.42	19.81
Galathowenia oculata	5.02	1.94	1.28	4.07	23.88
Paradoneis lyra	2.92	1.87	6.48	3.94	27.82
COPEPODA	3.42	1.87	6.48	3.94	31.75
NEMERTEA	2.87	1.86	7.98	3.92	35.68
Glycera_Juv	2.86	1.83	7.73	3.85	39.52
Parexogone hebes	3.13	1.67	4.99	3.52	43.04
Sabellaria spinulosa	5.24	1.66	2.65	3.49	46.53
Pholoe baltica	2.23	1.48	6.67	3.11	49.65
Ophelia borealis	2.15	1.43	5.95	3	52.65
Ophelia_Juv	3.31	1.39	6.54	2.92	55.57
Grania	2.38	1.38	3.04	2.9	58.47
Exogone verugera	3.31	1.29	1.39	2.71	61.19
THRACIOIDEA_Juv	2.19	1.14	5.1	2.4	63.58
Syllides	2.1	1.08	6.48	2.27	65.85
Owenia	2.09	1.02	2.2	2.14	68
Spiophanes kroyeri	1.75	0.92	3.02	1.94	69.94
Podarkeopsis capensis	1.28	0.8	5.1	1.69	71.63
Magelona alleni	1.28	0.8	5.1	1.69	73.33
Goniada maculata	1.47	0.8	6.54	1.69	75.01
Notomastus	1.28	0.8	6.54	1.69	76.7
Aurospio banyulensis	2.97	0.76	0.58	1.59	78.29
Nephtys_Juv	1.14	0.71	5.95	1.5	79.79
Cirratulus_Juv	1.87	0.71	5.95	1.5	81.3
Pholoe inornata	2.38	0.49	0.58	1.04	82.33
SIPUNCULA_Juv	1.73	0.49	0.58	1.03	83.37
Aricidea (Acmira) catherinae	1.77	0.42	0.58	0.88	84.25
Sphaerosyllis hystrix	1.05	0.4	0.58	0.84	85.09

Data worksheet					
Diplocirrus glaucus	1.15	0.36	0.58	0.76	85.86
Golfingia (Golfingia) vulgaris vulgaris	1.29	0.31	0.58	0.66	86.51
Eumida sanguinea	1.05	0.31	0.58	0.66	87.17
Mediomastus fragilis	1.67	0.31	0.58	0.66	87.83
Polycirrus	1.22	0.31	0.58	0.66	88.48
Gnathia oxyuraea	0.94	0.31	0.58	0.66	89.14
Mytilidae_Juv	1.35	0.31	0.58	0.66	89.79
Aricidea (Acmira) simonae	1.05	0.3	0.58	0.62	90.42
Group r					
Average similarity: 50.46					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Amphiuridae_Juv	3.16	6.08	#######	12.05	12.05
Echinocyamus pusillus	3.77	5.09	#######	10.08	22.13
NEMERTEA	2.22	3.85	#######	7.62	29.75
Parexogone hebes	2.58	3.85	#######	7.62	37.37
Edwardsiidae	1.87	3.33	#######	6.6	43.97
Glycera_Juv	1.98	3.33	#######	6.6	50.57
Ophelia borealis	1.98	3.33	#######	6.6	57.17
Nephtys_Juv	1.57	2.72	#######	5.39	62.55
Scoloplos armiger	1.57	2.72	#######	5.39	67.94
COPEPODA	1.57	2.72	#######	5.39	73.33
Paradoneis lyra	1.5	1.92	#######	3.81	77.14
Prionospio cirrifera	1	1.92	#######	3.81	80.95
Spiophanes bombyx	1	1.92	#######	3.81	84.76
Magelona alleni	1	1.92	#######	3.81	88.57
Tharyx killariensis	1.37	1.92	#######	3.81	92.38
Group e					
Average similarity: 35.47					

Data worksheet					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Echinocyamus pusillus	4.01	5.95	2.32	16.79	16.79
Glycera_Juv	2.72	5.51	4.8	15.53	32.32
NEMERTEA	2.17	4.21	3.83	11.86	44.19
COPEPODA	1.52	3.49	3.84	9.84	54.03
Ophelia borealis	1.58	2.98	3.68	8.41	62.43
Edwardsiidae	1.38	2.75	4.8	7.77	70.2
Parexogone hebes	1.33	2.47	3.84	6.96	77.16
Ophelia_Juv	2.3	2.22	0.58	6.27	83.43
Glycera lapidum	1.35	0.98	0.58	2.77	86.19
Sphaerosyllis hystrix	0.67	0.7	0.58	1.98	88.18
Grania	0.67	0.7	0.58	1.98	90.16
Group q					
Less than 2 samples in group					
Group t					
Average similarity: 57.05					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Amphiuridae_Juv	6.53	4.23	#######	7.41	7.41
Ophelia_Juv	3.58	3.57	#######	6.26	13.66
Echinocyamus pusillus	3.45	3.57	#######	6.26	19.92
Scoloplos armiger	3.32	2.99	#######	5.24	25.16
Exogone verugera	2.55	2.77	#######	4.85	30.01
Parexogone hebes	3	2.26	#######	3.96	33.97
Pholoe baltica	1.87	1.96	#######	3.43	37.39
COPEPODA	1.98	1.96	#######	3.43	40.82
Edwardsiidae	1.41	1.6	#######	2.8	43.62
NEMERTEA	1.57	1.6	#######	2.8	46.42
Lumbrineris cingulata	2.37	1.6	#######	2.8	49.22
Chaetozone christiei	1.57	1.6	#######	2.8	52.02

Data worksheet					
Perioculodes longimanus	1.71	1.6	#######	2.8	54.82
***Spisula*_Juv**	1.71	1.6	#######	2.8	57.62
Timoclea ovata	1.57	1.6	#######	2.8	60.42
***Sthenelais*_Juv**	1.37	1.13	#######	1.98	62.39
Eumida sanguinea	1	1.13	#######	1.98	64.37
Goniada maculata	1.21	1.13	#######	1.98	66.35
Streptosyllis websteri	1.21	1.13	#######	1.98	68.33
Sphaerosyllis hystrix	1	1.13	#######	1.98	70.31
Ophelia borealis	1.62	1.13	#######	1.98	72.29
Galathowenia oculata	1.21	1.13	#######	1.98	74.27
Polycirrus	1.37	1.13	#######	1.98	76.25
Tubificoides pseudogaster	1	1.13	#######	1.98	78.23
Sarsinebalia urgorrii	1.21	1.13	#######	1.98	80.21
Synchelidium maculatum	1.21	1.13	#######	1.98	82.19
Tanaopsis graciloides	1.37	1.13	#######	1.98	84.17
Pseudocuma (Pseudocuma) simile	1.21	1.13	#######	1.98	86.15
Cylichna cylindracea	1.21	1.13	#######	1.98	88.12
Antalis entalis	1	1.13	#######	1.98	90.1
Group p					
Average similarity: 49.96					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Echinocyamus pusillus	6.11	9.81	#######	19.63	19.63
COPEPODA	3.6	6.42	#######	12.85	32.49
***Amphiuridae*_Juv**	4.08	5.86	#######	11.73	44.22
Ophelia borealis	3.67	4.9	#######	9.82	54.03
***Ophelia*_Juv**	1.73	3.21	#######	6.43	60.46
***Nephtys*_Juv**	1.93	2.62	#######	5.25	65.71
Bathyporeia elegans	1.41	2.62	#######	5.25	70.95
Bathyporeia gracilis	1.41	2.62	#######	5.25	76.2
THRACIOIDEA_Juv	1.93	2.62	#######	5.25	81.45

Data worksheet					
Scoloplos armiger	1.5	1.85	#######	3.71	85.16
Peresiella clymenoides	1	1.85	#######	3.71	88.87
Owenia	1	1.85	#######	3.71	92.58
Group g					
Average similarity: 55.08					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Amphiuridae_Juv	4.99	5.09	#######	9.24	9.24
Pisione remota	4.59	3.91	#######	7.1	16.34
Echinocyamus pusillus	3.74	3.25	#######	5.91	22.24
Hesionura elongata	3.22	3.07	#######	5.57	27.81
***Glycera*_Juv**	2.91	3.07	#######	5.57	33.38
NEMERTEA	2.34	2.43	#######	4.4	37.79
Aricidea (Acmira) cerrutii	2.34	2.43	#######	4.4	42.19
COPEPODA	2.7	2.43	#######	4.4	46.59
Goniadella gracilis	2.32	2.17	#######	3.94	50.53
***Ophelia*_Juv**	2.8	2.17	#######	3.94	54.47
Owenia	1.87	1.88	#######	3.41	57.88
Grania	3.42	1.88	#######	3.41	61.29
Syllis parapari	1.71	1.53	#######	2.78	64.08
Streptosyllis campoyi	1.41	1.53	#######	2.78	66.86
Aonides paucibranchiata	1.93	1.53	#######	2.78	69.65
Notomastus	1.83	1.53	#######	2.78	72.43
Nephasoma (Nephasoma) minutum	1.21	1.08	#######	1.97	74.4
Eulalia mustela	1.62	1.08	#######	1.97	76.37
Glycera lapidum	1.21	1.08	#######	1.97	78.34
Syllis pontxioi	1	1.08	#######	1.97	80.31
Lumbrineris cingulata	1	1.08	#######	1.97	82.28
Aurospio banyulensis	1	1.08	#######	1.97	84.25
Scolelepis korsuni	1	1.08	#######	1.97	86.22
Pseudonotomastus southerni	1.5	1.08	#######	1.97	88.18

Data worksheet					
Polygordius	1.37	1.08	#######	1.97	90.15
Group w					
Average similarity: 50.66					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Amphiuridae_Juv	4.39	3.81	4.12	7.52	7.52
Echinocyamus pusillus	3.36	3.15	3.83	6.21	13.73
COPEPODA	3.05	2.96	3.61	5.85	19.59
Ophelia_Juv	2.95	2.79	3.55	5.51	25.1
Glycera lapidum	2.66	2.49	12.01	4.92	30.02
Parexogone hebes	3.53	2.38	0.9	4.7	34.72
NEMERTEA	2.66	2.24	8.81	4.43	39.15
Notomastus	1.8	1.99	9.82	3.93	43.07
Exogone verugera	2.3	1.94	3.97	3.83	46.9
Peresiella clymenoides	2.55	1.72	9.39	3.4	50.3
Lumbrineris cingulata	2.91	1.63	0.91	3.23	53.53
Aricidea (Acmira) cerrutii	1.91	1.55	3.96	3.05	56.58
Tharyx killariensis	1.31	1.41	3.61	2.77	59.35
Aurospio banyulensis	1.67	1.4	2.16	2.76	62.11
Galathowenia oculata	1.78	1.39	0.91	2.74	64.85
Spiophanes bombyx	1.52	1.38	5.98	2.72	67.56
Spiophanes kroyeri	1.41	1.22	6.56	2.41	69.98
Sphaerosyllis hystrix	1.25	1.15	9.82	2.27	72.24
Grania	1.37	0.95	0.91	1.88	74.12
Owenia	1.22	0.94	0.91	1.85	75.98
Pholoe baltica	1.47	0.89	0.86	1.77	77.74
Ophelia borealis	1.35	0.83	0.9	1.63	79.37
Streptosyllis websteri	1.27	0.77	0.91	1.52	80.89
Nephasoma (Nephasoma) minutum	1.39	0.72	0.87	1.41	82.3
Paradoneis lyra	1.1	0.66	0.89	1.3	83.61
Ophiuridae_Juv	1.78	0.63	0.86	1.25	84.85

Data worksheet					
Syllis parapari	0.85	0.62	0.91	1.22	86.08
Nephtys_Juv	0.85	0.62	0.91	1.22	87.3
Edwardsiidae	1.1	0.62	0.89	1.22	88.52
Scoloplos armiger	1.04	0.62	0.9	1.22	89.74
Astrorhiza	1.16	0.61	0.9	1.21	90.95
Group b					
Less than 2 samples in group					
Group x					
Average similarity: 25.34					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Amphiuridae_Juv	4.06	5.23	1.71	20.64	20.64
Pholoe baltica	2.92	3.46	2.85	13.66	34.3
Lumbrineris cingulata	3.51	2.99	1.67	11.79	46.09
Eudorella truncatula	2.2	2.45	2.85	9.66	55.75
Edwardsiidae	1.14	1.77	4.96	7	62.75
Scalibregma inflatum	4.19	1.77	4.96	7	69.75
NEMERTEA	2.33	1.41	0.58	5.55	75.3
COPEPODA	1.61	1.41	0.58	5.55	80.85
Nuculidae_Juv	1.72	1.21	0.58	4.76	85.61
Goniadidae_Juv	1	0.7	0.58	2.78	88.39
Goniada maculata	0.8	0.7	0.58	2.78	91.16
Group f					
Less than 2 samples in group					
Group c					
Less than 2 samples in group					
Group a					

Data worksheet					
Less than 2 samples in group					
Group k					
Average similarity: 44.20					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Galathowenia oculata	5.48	6.26	8.42	14.15	14.15
Amphiuridae_Juv	4.6	5.73	5.58	12.97	27.13
Owenia	2.11	2.81	7.15	6.36	33.49
COPEPODA	2.02	2.28	1.73	5.17	38.65
Amphiura filiformis	1.46	1.94	5.75	4.39	43.04
NEMERTEA	1.61	1.92	4.49	4.34	47.38
Lumbrineris cingulata	2.05	1.74	1.05	3.94	51.32
Echinocyamus pusillus	2.12	1.62	0.99	3.67	54.99
Aricidea (Acmira) catherinae	1.32	1.21	1.12	2.73	57.72
Glycera lapidum	1.11	1.21	1.06	2.73	60.45
Paradoneis lyra	1.71	1.16	0.62	2.63	63.08
Exogone verugera	1.34	1.16	1.03	2.62	65.7
Nephtys hombergii	1.08	0.98	1.11	2.22	67.92
Peresiella clymenoides	0.97	0.98	1.11	2.22	70.14
Poecilochaetus serpens	0.97	0.92	1.15	2.08	72.22
Scoloplos armiger	0.8	0.92	1.13	2.08	74.3
Pholoe baltica	1	0.87	1.14	1.97	76.27
Antalis entalis	0.88	0.87	1.14	1.96	78.23
Diplocirrus glaucus	1.44	0.84	0.62	1.91	80.13
Kurtiella bidentata	1.03	0.64	0.62	1.44	81.58
Parexogone hebes	0.89	0.56	0.61	1.26	82.84
Ophelia_Juv	0.89	0.54	0.62	1.23	84.07
Nephasoma (Nephasoma) minutum	0.75	0.5	0.61	1.13	85.19
Harpinia antennaria	0.95	0.48	0.6	1.09	86.29
THRACIOIDEA_Juv	0.6	0.46	0.62	1.03	87.32
Astrorhiza	0.77	0.45	0.6	1.02	88.34

Data worksheet					
Glycera_Juv	0.75	0.39	0.62	0.89	89.23
Glycera alba	0.75	0.39	0.62	0.89	90.12

F3 Univariate Analysis Results

S= number of species, N= Abundance, d = Margalef's index of Richness; J' = Pielou's Evenness index; H' = Shannon-Wiener Diversity index; λ = Simpson's index of Dominance.

Sampling Station	Biotope	S	N	d	J'	H'	λ
ENV028	SS.SSa.CFiSa.EpusOborApri	51	95	10.98	0.9645	3.792	0.9846
ENV029	SS.SSa.CFiSa.EpusOborApri	26	37	6.905	0.9651	3.144	0.976
ENV030	SS.SSa.CFiSa.EpusOborApri	33	55	7.987	0.9653	3.375	0.9791
ENV031	SS.SSa.CFiSa.EpusOborApri	69	127	14.04	0.9581	4.057	0.9864
ENV032	SS.SSa.CFiSa.EpusOborApri	78	157	15.22	0.9535	4.154	0.9872
ENV033	SS.SSa.CFiSa.EpusOborApri	69	145	13.67	0.9475	4.012	0.9837
ENV034	SS.SSa.CFiSa.EpusOborApri	39	66	9.069	0.9699	3.553	0.9828
ENV035	SS.SSa.CFiSa.EpusOborApri	48	76	10.86	0.9588	3.712	0.9829
ENV036	SS.SSa.CFiSa.EpusOborApri	85	176	16.25	0.9592	4.262	0.9887
ENV037	SS.SSa.CFiSa.EpusOborApri	66	123	13.51	0.9661	4.047	0.9876
ENV038	SS.SSa.CFiSa.EpusOborApri	35	58	8.384	0.959	3.409	0.9776
ENV039	SS.SSa.CFiSa.EpusOborApri	21	32	5.789	0.9747	2.967	0.9749
ENV040	SS.SSa.CFiSa.EpusOborApri	39	52	9.596	0.9771	3.58	0.9879
ENV041	SS.SSa.CFiSa.EpusOborApri	41	78	9.17	0.9346	3.471	0.9719
ENV042	SS.SSa.CFiSa.EpusOborApri	21	29	5.923	0.9717	2.958	0.9749
ENV043	SS.SSa.CFiSa.EpusOborApri	31	51	7.618	0.9493	3.26	0.9718
ENV044	SS.SSa.CFiSa.EpusOborApri	66	142	13.11	0.9454	3.961	0.9829

Sampling Station	Biotope	S	N	d	J’	H’	λ
ENV045	SS.SSa.CFiSa.EpusOborApri	45	82	9.984	0.9507	3.619	0.9776
ENV046	SS.SSa.CFiSa.EpusOborApri	67	114	13.93	0.9608	4.04	0.9874
ENV047	SS.SSa.CFiSa.EpusOborApri	59	128	11.95	0.9499	3.873	0.9818
ENV048	SS.SSa.CFiSa.EpusOborApri	42	75	9.49	0.9601	3.588	0.9805
ENV049	SS.SSa.CFiSa.EpusOborApri	43	82	9.541	0.9589	3.606	0.9802
ENV050	SS.SSa.CFiSa.EpusOborApri	33	59	7.861	0.9499	3.321	0.9732
ENV051	SS.SSa.CFiSa.EpusOborApri	54	86	11.9	0.958	3.821	0.984
ENV052	SS.SSa.CFiSa.EpusOborApri	48	75	10.88	0.9659	3.739	0.9853
ENV053	SS.SSa.CFiSa.EpusOborApri	63	125	12.84	0.9466	3.922	0.9828
ENV054	SS.SSa.CFiSa.EpusOborApri	33	53	8.071	0.9657	3.377	0.9793
ENV055	SS.SSa.CFiSa.EpusOborApri	35	55	8.499	0.9628	3.423	0.9801
ENV056	SS.SSa.CFiSa.EpusOborApri	68	110	14.26	0.9728	4.105	0.99
ENV057	SS.SSa.CFiSa.EpusOborApri	34	53	8.301	0.9417	3.321	0.9689
ENV058	SS.SSa.CFiSa.EpusOborApri	27	44	6.864	0.9635	3.176	0.9723
ENV059	SS.SSa.CFiSa.EpusOborApri	75	136	15.07	0.9592	4.141	0.9879
ENV060	SS.SSa.CFiSa.EpusOborApri	35	56	8.439	0.9682	3.442	0.9811
ENV061	SS.SSa.CFiSa.EpusOborApri	37	57	8.885	0.9732	3.514	0.9835
ENV062	SS.SSa.CFiSa.EpusOborApri	63	104	13.34	0.9554	3.959	0.9853
ENV063	SS.SSa.CFiSa.EpusOborApri	41	69	9.449	0.9546	3.545	0.9795
ENV064	SS.SSa.CFiSa.EpusOborApri	40	64	9.37	0.9595	3.539	0.9804

Sampling Station	Biotope	S	N	d	J’	H’	λ
ENV065	SS.SSa.CFiSa.EpusOborApri	38	71	8.694	0.9692	3.526	0.9809
ENV066	SS.SSa.CFiSa.EpusOborApri	36	63	8.446	0.9591	3.437	0.9778
ENV067	SS.SSa.CFiSa.EpusOborApri	35	55	8.475	0.9495	3.376	0.9737
ENV068	SS.SSa.CFiSa.EpusOborApri	36	53	8.821	0.9676	3.467	0.9821
ENV069	SS.SSa.CFiSa.EpusOborApri	59	101	12.56	0.9559	3.898	0.9834
ENV070	SS.SSa.CFiSa.EpusOborApri	49	76	11.08	0.9728	3.786	0.9874
ENV071	SS.SSa.CFiSa.EpusOborApri	45	83	9.946	0.9537	3.63	0.9797
ENV072	SS.SSa.CFiSa.EpusOborApri	29	51	7.112	0.939	3.162	0.9648
ENV074	SS.SSa.CFiSa.EpusOborApri	35	63	8.191	0.9638	3.427	0.9787
ENV075	SS.SSa.CFiSa.EpusOborApri	45	75	10.2	0.9567	3.642	0.9806
ENV076	SS.SSa.CFiSa.EpusOborApri	44	81	9.79	0.9566	3.62	0.98
ENV078	SS.SSa.CFiSa.EpusOborApri	46	88	10.06	0.9596	3.674	0.9811
ENV079	SS.SSa.CFiSa.EpusOborApri	36	59	8.575	0.9599	3.44	0.9792
ENV080	SS.SSa.CFiSa.EpusOborApri	26	45	6.582	0.9517	3.101	0.969
ENV081	SS.SSa.CFiSa.EpusOborApri	57	106	12	0.9523	3.85	0.9831
ENV082	SS.SSa.CFiSa.EpusOborApri	54	88	11.83	0.9624	3.839	0.9854
ENV083	SS.SSa.CFiSa.EpusOborApri	30	49	7.452	0.9594	3.263	0.9753
ENV084	SS.SSa.CFiSa.EpusOborApri	37	57	8.919	0.9558	3.451	0.9783
ENV085	SS.SSa.CFiSa.EpusOborApri	60	109	12.58	0.9587	3.925	0.9855
ENV086	SS.SSa.CFiSa.EpusOborApri	35	58	8.363	0.9714	3.454	0.9818

Sampling Station	Biotope	S	N	d	J’	H’	λ
ENV087	SS.SSa.CFiSa.EpusOborApri	44	72	10.05	0.9507	3.598	0.9801
ENV088	SS.SSa.CFiSa.EpusOborApri	33	49	8.206	0.9721	3.399	0.9826
ENV089	SS.SSa.CFiSa.EpusOborApri	51	85	11.27	0.967	3.802	0.9858
ENV090	SS.SSa.CFiSa.EpusOborApri	55	98	11.77	0.962	3.855	0.9851
ENV091	SS.SSa.CFiSa.EpusOborApri	53	83	11.75	0.962	3.819	0.9857
ENV092	SS.SSa.CFiSa.EpusOborApri	56	103	11.88	0.9461	3.808	0.9805
ENV093	SS.SSa.CFiSa.EpusOborApri	49	100	10.43	0.9445	3.676	0.9784
ENV002	SS.SSa.CMuSa.AalbNuc	11	20	3.338	0.9264	2.221	0.9105
ENV003	SS.SSa.CMuSa	21	31	5.814	0.9556	2.909	0.9662
ENV004	SS.SSa.CMuSa	31	79	6.857	0.928	3.187	0.9614
ENV005	SS.SSa.CMuSa	32	64	7.467	0.9216	3.194	0.9574
ENV006	SS.SCS.CCS.MedLumVen	59	97	12.67	0.9477	3.864	0.9817
ENV007	SS.SSa.CFiSa.EpusOborApri	29	47	7.271	0.9657	3.252	0.9774
ENV008	SS.SSa.CFiSa.EpusOborApri	15	21	4.58	0.9742	2.638	0.9681
ENV009	SS.SSa.CFiSa.EpusOborApri	22	31	6.14	0.961	2.971	0.9719
ENV010	SS.SSa.CFiSa.EpusOborApri	20	32	5.494	0.9666	2.896	0.969
ENV011	SS.SSa.OSa	2	2	1.443	1	0.6931	1
ENV012	SS.SSa.CFiSa.EpusOborApri	30	47	7.552	0.976	3.319	0.9818
ENV013	SS.SSa.CFiSa.EpusOborApri	50	74	11.39	0.9782	3.827	0.9894
ENV014	SS.SSa.CFiSa.EpusOborApri	50	92	10.83	0.9597	3.754	0.9827

Sampling Station	Biotope	S	N	d	J’	H’	λ
ENV015	SS.SSa.CFiSa.EpusOborApri	60	125	12.22	0.9578	3.921	0.9843
ENV016	SS.SSa.CFiSa.EpusOborApri	50	83	11.08	0.9573	3.745	0.9825
ENV017	SS.SSa.CFiSa.EpusOborApri	35	51	8.628	0.9709	3.452	0.9836
ENV018	SS.SSa.CFiSa.EpusOborApri	46	65	10.79	0.9655	3.696	0.9853
ENV019	SS.SSa.CFiSa.EpusOborApri	51	81	11.37	0.9441	3.712	0.9783
ENV020	SS.SSa.CFiSa.EpusOborApri	34	50	8.42	0.9641	3.4	0.9804
ENV021	SS.SSa.CFiSa.EpusOborApri	49	83	10.86	0.96	3.736	0.9832
ENV022	SS.SSa.CFiSa.EpusOborApri	46	77	10.37	0.964	3.691	0.9838
ENV023	SS.SSa.CFiSa.EpusOborApri	49	78	11.01	0.9671	3.764	0.9858
ENV024	SS.SSa.CFiSa.EpusOborApri	86	193	16.16	0.9505	4.234	0.9868
ENV025	SS.SSa.CFiSa.EpusOborApri	42	72	9.572	0.9566	3.575	0.98
ENV026	SS.SSa.CFiSa.EpusOborApri	33	58	7.879	0.9508	3.325	0.9738
ENV027	SS.SSa.CFiSa.EpusOborApri	44	74	9.978	0.9411	3.561	0.9753

ANNEX G. BENTHIC EPIFAUNAL DATA

G1 Epifaunal Data Multivariate Analysis Results

Data worksheet					
Name: Data1					
Data type: Abundance					
Sample selection: All					
Variable selection: All					
Parameters					
Resemblance: S17 Bray Curtis similarity					
Cut off for low contributions: 90.00%					
Factor Groups					
Sample	Group				
ENV028	b				
ENV030	b				
ENV031	b				
ENV032	b				
ENV033	b				
ENV034	b				
ENV035	b				
ENV036	b				
ENV037	b				
ENV039	b				
ENV040	b				
ENV041	b				
ENV043	b				
ENV044	b				
ENV045	b				
ENV046	b				
ENV047	b				
ENV048	b				

Data worksheet					
ENV049	b				
ENV050	b				
ENV051	b				
ENV052	b				
ENV053	b				
ENV055	b				
ENV056	b				
ENV057	b				
ENV058	b				
ENV059	b				
ENV060	b				
ENV061	b				
ENV062	b				
ENV063	b				
ENV064	b				
ENV065	b				
ENV066	b				
ENV067	b				
ENV068	b				
ENV069	b				
ENV070	b				
ENV071	b				
ENV074	b				
ENV075	b				
ENV076	b				
ENV078	b				
ENV080	b				
ENV081	b				
ENV082	b				
ENV084	b				
ENV085	b				
ENV086	b				

Data worksheet					
ENV088	b				
ENV089	b				
ENV090	b				
ENV091	b				
ENV092	b				
ENV093	b				
ENV003	b				
ENV004	b				
ENV005	b				
ENV006	b				
ENV007	b				
ENV008	b				
ENV009	b				
ENV010	b				
ENV012	b				
ENV013	b				
ENV014	b				
ENV015	b				
ENV016	b				
ENV017	b				
ENV018	b				
ENV019	b				
ENV020	b				
ENV021	b				
ENV022	b				
ENV023	b				
ENV024	b				
ENV025	b				
ENV026	b				
ENV027	b				
ENV029	a				
ENV038	a				

Data worksheet					
ENV042	a				
ENV054	a				
ENV072	a				
ENV079	a				
ENV083	a				
ENV087	a				
ENV002	a				
ENV011	a				
Group b					
Average similarity: 8.71					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Merona cornucopiae	0.28	2.39	0.26	27.48	27.48
Flustra foliacea	0.26	2.09	0.24	24.06	51.53
Folliculinidae	0.23	1.11	0.21	12.7	64.23
***Paguridae* (Hermit crabs)**	0.19	0.83	0.15	9.52	73.75
PORIFERA	0.15	0.56	0.14	6.39	80.14
FILIFERA	0.09	0.24	0.08	2.81	82.94
***Actiniidae Urticina* sp.**	0.11	0.21	0.09	2.45	85.4
Onuphidae	0.1	0.19	0.07	2.23	87.63
Munida rugosa	0.09	0.15	0.08	1.67	89.3
Escharella immersa	0.08	0.14	0.06	1.56	90.86
Group a					
All the similarities are zero					

G2 Epifaunal Data Univariate Analysis Results

Note: Where results are displayed as ****, PRIMER was unable to complete the calculation due to the presence of too few species or individuals.

Sampling Station	Biotope	S	N	d	J’	H’	λ
ENV028	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV029	SS.SSa.OSa	0	0	****	****	0	****
ENV030	SS.SMx.CMx	1	1	****	****	0	****
ENV031	SS.SMx.CMx	11	11	4.17	1	2.398	1
ENV032	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV033	SS.SMx.CMx	4	4	2.164	1	1.386	1
ENV034	SS.SMx.CMx	0	0	****	****	0	****
ENV035	SS.SMx.CMx	3	3	1.82	1	1.099	1
ENV036	SS.SMx.CMx	8	8	3.366	1	2.079	1
ENV037	SS.SMx.CMx	3	3	1.82	1	1.099	1
ENV038	SS.SSa.OSa	0	0	****	****	0	****
ENV039	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV040	SS.SMx.CMx	3	3	1.82	1	1.099	1
ENV041	SS.SMx.CMx	0	0	****	****	0	****
ENV042	SS.SSa.OSa	0	0	****	****	0	****
ENV043	SS.SMx.CMx	1	1	****	****	0	****
ENV044	SS.SMx.CMx	4	4	2.164	1	1.386	1

Sampling Station	Biotope	S	N	d	J'	H'	λ
ENV045	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV046	SS.SMx.CMx	5	6	2.291	0.9818	1.58	0.9533
ENV047	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV048	SS.SMx.CMx	1	1	****	****	0	****
ENV049	SS.SMx.CMx	4	4	2.164	1	1.386	1
ENV050	SS.SMx.CMx	1	1	****	****	0	****
ENV051	SS.SMx.CMx	3	3	1.82	1	1.099	1
ENV052	SS.SMx.CMx	0	0	****	****	0	****
ENV053	SS.SMx.CMx	1	1	****	****	0	****
ENV054	SS.SSa.OSa	0	0	****	****	0	****
ENV055	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV056	SS.SMx.CMx	3	3	1.629	0.9871	1.084	0.9289
ENV057	SS.SMx.CMx	1	1	****	****	0	****
ENV058	SS.SMx.CMx	1	1	****	****	0	****
ENV059	SS.SMx.CMx	3	3	1.82	1	1.099	1
ENV060	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV061	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV062	SS.SMx.CMx	8	8	3.366	1	2.079	1
ENV063	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV064	SS.SMx.CMx	6	6	2.791	1	1.792	1

Sampling Station	Biotope	S	N	d	J’	H’	λ
ENV065	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV066	SS.SMx.CMx	3	3	1.82	1	1.099	1
ENV067	SS.SMx.CMx	0	0	****	****	0	****
ENV068	SS.SMx.CMx	1	1	****	****	0	****
ENV069	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV070	SS.SMx.CMx	4	4	2.164	1	1.386	1
ENV071	SS.SMx.CMx	1	1	****	****	0	****
ENV072	SS.SSa.OSa	0	0	****	****	0	****
ENV074	SS.SMx.CMx	0	0	****	****	0	****
ENV075	SS.SMx.CMx	4	4	2.164	1	1.386	1
ENV076	SS.SMx.CMx	1	1	****	****	0	****
ENV078	SS.SMx.CMx	1	1	****	****	0	****
ENV079	SS.SSa.OSa	1	1	****	****	0	****
ENV080	SS.SMx.CMx	1	1	****	****	0	****
ENV081	SS.SMx.CMx	10	10	3.909	1	2.303	1
ENV082	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV083	SS.SSa.OSa	0	0	****	****	0	****
ENV084	SS.SMx.CMx	1	1	****	****	0	****
ENV085	SS.SMx.CMx	3	3	1.82	1	1.099	1
ENV086	SS.SMx.CMx	0	0	****	****	0	****

Sampling Station	**Biotope**	**S**	**N**	**d**	**J'**	**H'**	**λ**
ENV087	SS.SSa.OSa	0	0	****	****	0	****
ENV088	SS.SMx.CMx	0	0	****	****	0	****
ENV089	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV090	SS.SMx.CMx	5	6	2.291	0.9818	1.58	0.9533
ENV091	SS.SMx.CMx	5	5	2.485	1	1.609	1
ENV092	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV093	SS.SMx.CMx	3	3	1.82	1	1.099	1
ENV002	SS.SSa.OSa	0	0	****	****	0	****
ENV003	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV004	SS.SMx.CMx	0	0	****	****	0	****
ENV005	SS.SMx.CMx	1	1	****	****	0	****
ENV006	SS.SMx.CMx	9	9	3.641	1	2.197	1
ENV007	SS.SMx.CMx	3	3	1.82	1	1.099	1
ENV008	SS.SMx.CMx	3	3	1.629	0.9871	1.084	0.9289
ENV009	SS.SMx.CMx	9	9	3.641	1	2.197	1
ENV010	SS.SMx.CMx	3	3	1.82	1	1.099	1
ENV011	SS.SSa.OSa	0	0	****	****	0	****
ENV012	SS.SMx.CMx	2	2	1.135	0.9787	0.6784	0.8284
ENV013	SS.SMx.CMx	6	6	2.791	1	1.792	1
ENV014	SS.SMx.CMx	1	1	****	****	0	****

Sampling Station	**Biotope**	**S**	**N**	**d**	**J’**	**H’**	λ
ENV015	SS.SMx.CMx	9	9	3.641	1	2.197	1
ENV016	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV017	SS.SMx.CMx	5	5	2.485	1	1.609	1
ENV018	SS.SMx.CMx	4	4	2.164	1	1.386	1
ENV019	SS.SMx.CMx	2	2	1.135	0.9787	0.6784	0.8284
ENV020	SS.SMx.CMx	2	2	1.443	1	0.6931	1
ENV021	SS.SMx.CMx	3	3	1.82	1	1.099	1
ENV022	SS.SMx.CMx	7	7	3.083	1	1.946	1
ENV023	SS.SMx.CMx	6	6	2.791	1	1.792	1
ENV024	SS.SMx.CMx	4	4	2.164	1	1.386	1
ENV025	SS.SMx.CMx	2	2	1.135	0.9787	0.6784	0.8284
ENV026	SS.SMx.CMx	0	0	****	****	0	****
ENV027	SS.SMx.CMx	4	4	2.164	1	1.386	1

ANNEX H. ANNEX I REEF ASSESSMENTS

Sampling Station	Sediment Description	Rock Veneer	Rock Extent (m^2)	Rock Cover (%)	Stony Extent (m^2)	Stony Elevation (m)	Stony Biota	Cobble Cover (%)	Total Cover (%)	Reefiness	Justification
ENV058	A5.2 - Subtidal Sand	0	0	0	< 25 m^2	64 mm - 5 m	<80% epifauna	7.56	7.56	Not a reef	< 25 m^2 and <10% cover
ENV064	A5.4 - Subtidal Mixed Sediment	0	0	0	< 25 m^2	< 64 mm	No visible fauna	1.36	1.36	Not a reef	< 25 m^2 and <10% cover
ENV069	A5.2 - Subtidal Sand	0	0	0	< 25 m^2	64 mm - 5 m	<80% epifauna	15.10	15.10	Not a reef	< 25 m^2 and <10% cover
ENV072	A5.2 - Subtidal Sand	0	0	0	< 25 m^2	64 mm - 5 m	Dominated by epifauna (>80%)	23.94	23.94	Not a reef	< 25 m^2 and <10% cover
ENV073	A5.4 - Subtidal Mixed Sediment	0	0	0	< 25 m^2	64 mm - 5 m	Dominated by epifauna (>80%)	18.00	18.00	Not a reef	< 25 m^2 and <10% cover
ENV073	A5.4 - Subtidal Mixed Sediment	0	0	0	< 25 m^2	< 64 mm	<80% epifauna	9.63	9.63	Not a reef	< 25 m^2 and <10% cover
ENV077	A5.4 - Subtidal Mixed Sediment	0	0	0	< 25 m^2	64 mm - 5 m	<80% epifauna	7.73	7.73	Not a reef	< 25 m^2 and <10% cover
ENV077	A5.4 - Subtidal Mixed Sediment	0	0	0	< 25 m^2	64 mm - 5 m	<80% epifauna	22.70	22.70	Not a reef	Area of >10% <25 m^2
ENV077	A5.4 - Subtidal Mixed Sediment	0	0	0	< 25 m^2	< 64 mm	<80% epifauna	28.24	28.24	Not a reef	Area of >10% <25 m^2
ENV088	A4.2 - Moderate Energy Circalittoral Rock	0	0	0	< 25 m^2	64 mm - 5 m	<80% epifauna	5.48	10.59	Not a reef	< 25 m^2

Sampling Station	Sediment Description	Rock Veneer	Rock Extent (m^2)	Rock Cover (%)	Stony Extent (m^2)	Stony Elevation (m)	Stony Biota	Cobble Cover (%)	Total Cover (%)	Reefiness	Justification
ENV088	A4.2 - Moderate Energy Circalittoral Rock	0	0	0	< 25 m^2	64 mm - 5 m	Dominated by epifauna (>80%)	6.73	10.94	Not a reef	< 25 m^2
ENV088	A4.2 - Moderate Energy Circalittoral Rock	0	0	0	< 25 m^2	64 mm - 5 m	Dominated by epifauna (>80%)	8.90	15.84	Not a reef	< 25 m^2
ENV090	A5.4 - Subtidal Mixed Sediment	0	0	0	< 25 m^2	64 mm - 5 m	<80% epifauna	18.71	18.71	Not a reef	< 25 m^2
ENV007	A5.4 - Subtidal Mixed Sediment	0	0	0	< 25 m^2	< 64 mm	<80% epifauna	5.75	5.75	Not a reef	< 25 m^2 and <10% cover
ENV007	A5.4 - Subtidal Mixed Sediment	0	0	0	< 25 m^2	< 64 mm	<80% epifauna	5.43	5.43	Not a reef	< 25 m^2 and <10% cover
ENV008	A5.4 - Subtidal Mixed Sediment	0	0	0	< 25 m^2	< 64 mm	<80% epifauna	6.93	6.93	Not a reef	< 25 m^2 and <10% cover
ENV008	A5.4 - Subtidal Mixed Sediment	0	0	0	< 25 m^2	< 64 mm	<80% epifauna	1.30	1.30	Not a reef	< 25 m^2 and <10% cover
ENV008	A5.4 - Subtidal Mixed Sediment	0	0	0	< 25 m^2	64 mm - 5 m	Dominated by epifauna (>80%)	20.17	20.17	Not a reef	<25 m^2
ENV009	A5.4 - Subtidal Mixed Sediment	0	0	0	< 25 m^2	< 64 mm	<80% epifauna	14.99	14.99	Not a reef	Area of >10% <25 m^2
ENV009	A5.4 - Subtidal Mixed Sediment	0	0	0	< 25 m^2	< 64 mm	Dominated by epifauna (>80%)	2.76	2.76	Not a reef	< 25 m^2 and <10% cover

Sampling Station	Sediment Description	Rock Veneer	Rock Extent (m^2)	Rock Cover (%)	Stony Extent (m^2)	Stony Elevation (m)	Stony Biota	Cobble Cover (%)	Total Cover (%)	Reefiness	Justification
ENV011	A5.2 - Subtidal Sand	0	0	0	< 25 m^2	64 mm - 5 m	<80% epifauna	1.87	1.87	Not a reef	< 25 m^2 and <10% cover
ENV011	A5.2 - Subtidal Sand	0	0	0	< 25 m^2	< 64 mm	<80% epifauna	16.81	16.81	Not a reef	< 25 m^2
ENV017	A5.2 - Subtidal Sand	0	0	0	< 25 m^2	< 64 mm	<80% epifauna	2.69	2.69	Not a reef	<10%
ENV017	A5.2 - Subtidal Sand	0	0	0	< 25 m^2	< 64 mm	Dominated by epifauna (>80%)	7.33	7.33	Not a reef	<10%
ENV017	A5.2 - Subtidal Sand	0	0	0	< 25 m^2	< 64 mm	Dominated by epifauna (>80%)	17.22	17.22	Not a reef	<10%
ENV022	A5.2 - Subtidal Sand	0	0	0	< 25 m^2	< 64 mm	Dominated by epifauna (>80%)	4.76	4.76	Not a reef	<10%
ENV022	A5.2 - Subtidal Sand	0	0	0	< 25 m^2	64 mm - 5 m	<80% epifauna	8.86	8.86	Not a reef	< 25 m^2 and <10% cover
ENV022	A5.2 - Subtidal Sand	0	0	0	< 25 m^2	< 64 mm	<80% epifauna	2.39	2.39	Not a reef	< 25 m^2 and <10% cover

ANNEX I. EDNA ANALYSIS RESULTS

I1.1.1 Figure I.1 presents a view of the species detected within the samples collected for eDNA analysis and their taxonomic relationship, with names on the same branch being more similar than those on different branches. The highest taxonomic rank (e.g. kingdom, phylum, class) is at the centre of the figure, moving out through the ranks of order, family, genus, and species towards the outer edge. The figure legend indicates the number of species, going from grey which indicates very few species, to blue which indicates a greater number of species

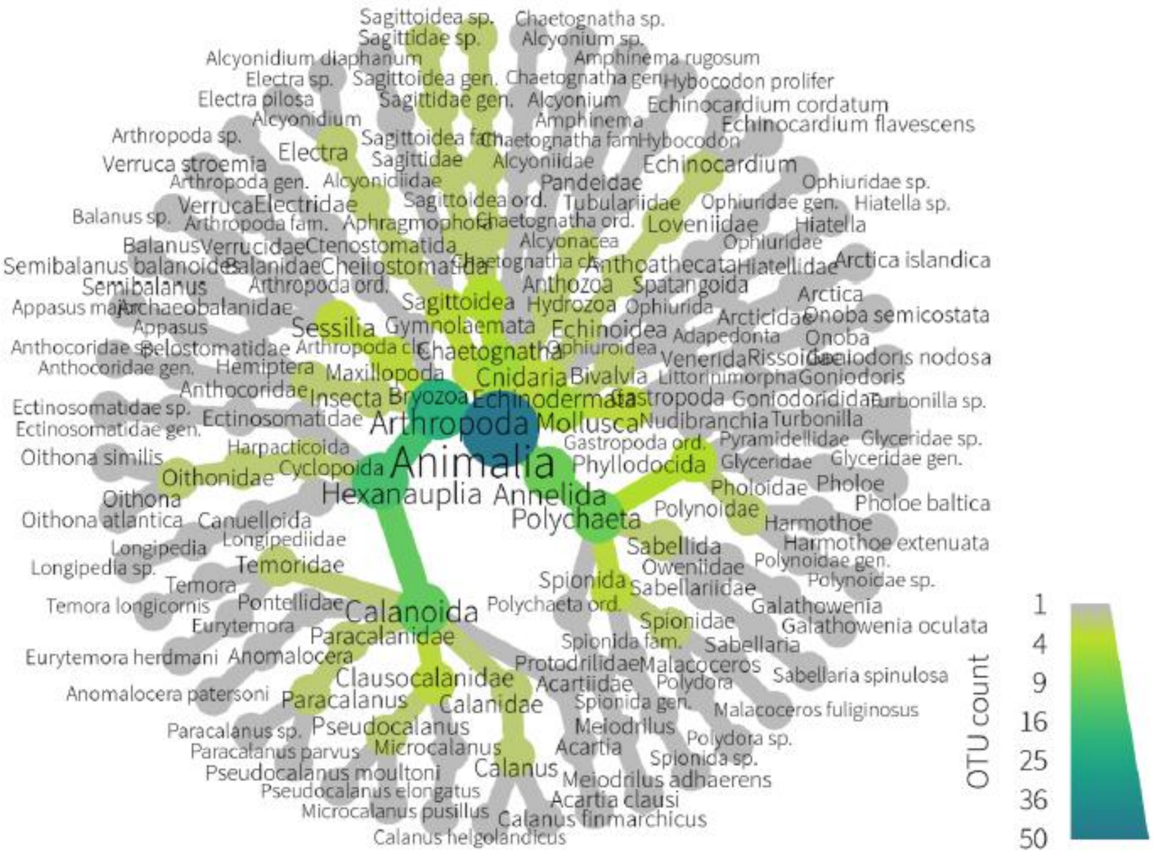


Figure I.1: Taxonomic Tree from eDNA Analysis

I1.1.2 Figure I.2 lists the species found in each sample, with the presence of a bubble indicating that the species was detected within the sample. The size of the bubble represents the proportion of DNA sequences within a sample, and a larger bubble indicated a stronger eDNA signal. The signal may be linked to the abundance of species in the environment but should be interpreted with caution, as the signal can also be impacted by biological, environmental, and technical factors.

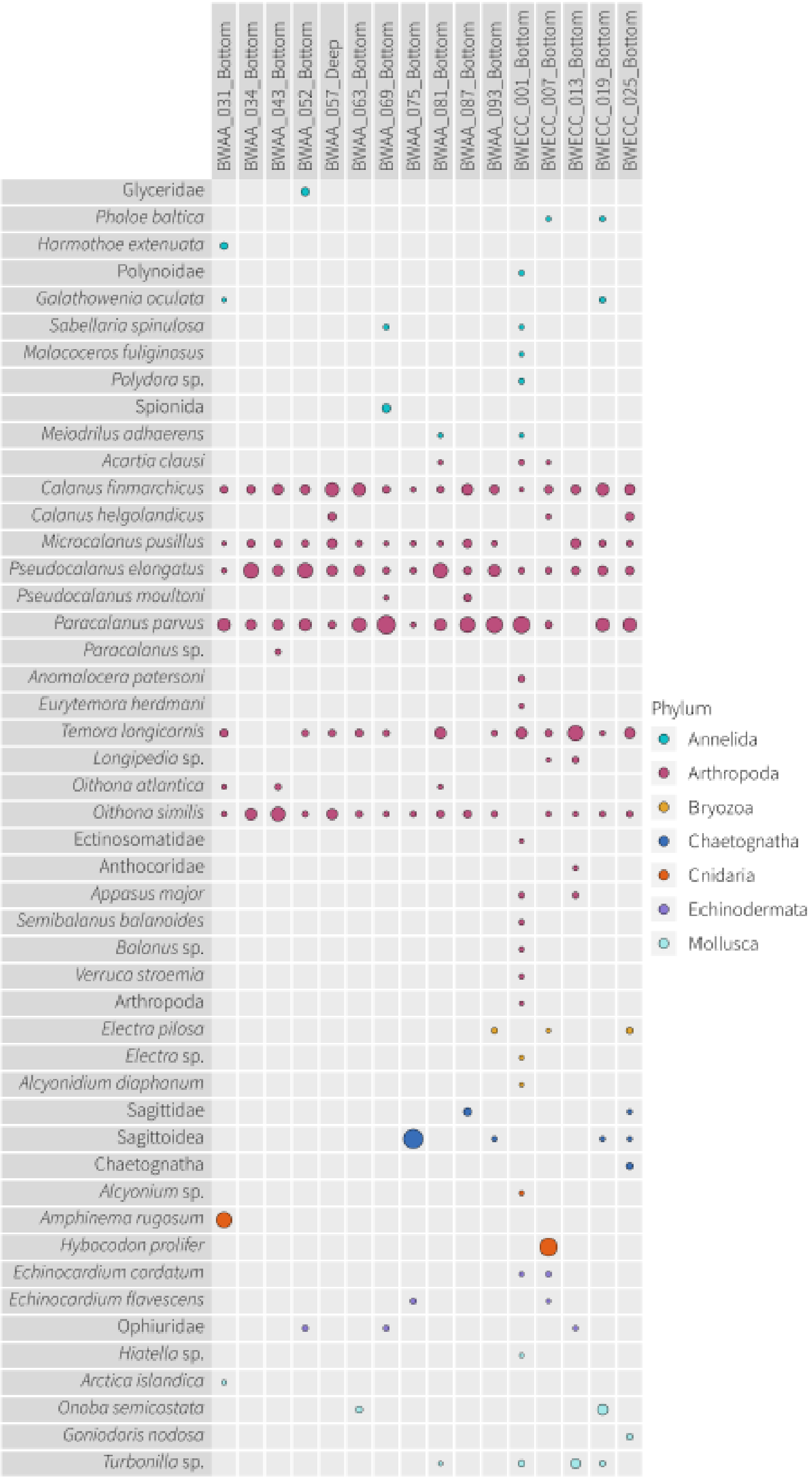


Figure I.2: Species per Sampe from eDNA Analysis