



## Fair Isle Harbour Improvement Works

### A.14 Benthic Survey Report

On behalf of **Shetland Isle Council (SIC)**



Project Ref: 11168 | Rev: Version 1.0 | Date: April 2023

---

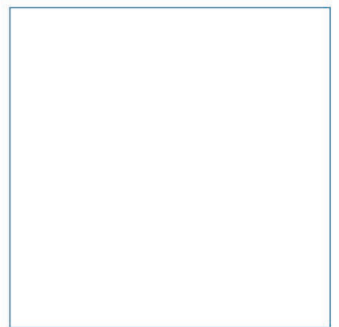
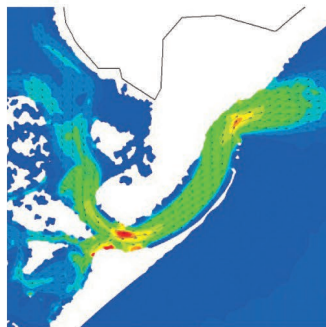
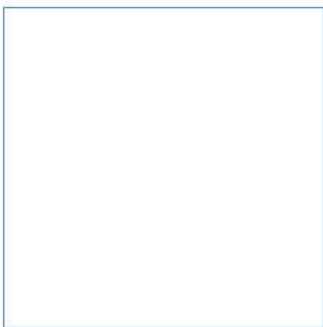
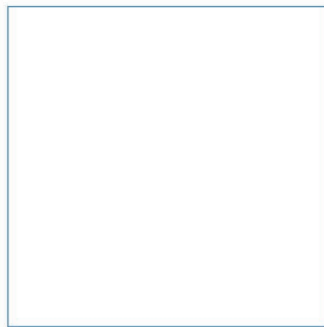
Registered Office: Buckingham Court Kingsmead Business Park, London Road, High Wycombe, Buckinghamshire, HP11 1JU  
Office Address: 10 Queen Square, Bristol, BS1 4NT  
T: +44 (0)117 332 7840 E: bristol@stantec.com

Stantec

# Fair Isle Ferry Upgrade

Benthic Survey Report

January 2023



Innovative Thinking - Sustainable Solutions



Page intentionally left blank



# Fair Isle Ferry Upgrade

## Benthic Survey Report

January 2023



# Document Information

| Document History and Authorisation |                         |                          |
|------------------------------------|-------------------------|--------------------------|
| <b>Title</b>                       | Fair Isle Ferry Upgrade |                          |
|                                    | Benthic Survey Report   |                          |
| <b>Commissioned by</b>             | Stantec                 |                          |
| <b>Issue date</b>                  | January 2023            |                          |
| <b>Document ref</b>                | R.4064                  |                          |
| <b>Project no</b>                  | R/5177                  |                          |
| Date                               | Version                 | Revision Details         |
| 15/11/2022                         | 1                       | Issued for client review |
| 11/01/2023                         | 2                       | Issued for client use    |
|                                    |                         |                          |
|                                    |                         |                          |

| Prepared (PM) | Approved (QM) | Authorised (PD) |
|---------------|---------------|-----------------|
| Vicky West    | Colin Trigg   | Stephen Hull    |
| [Redacted]    | [Redacted]    | [Redacted]      |

## Suggested Citation

ABPmer, (2023). Fair Isle Ferry Upgrade, Benthic Survey Report, ABPmer Report No. R.4064.  
A report produced by ABPmer for Stantec, January 2023.

## Notice

ABP Marine Environmental Research Ltd ("ABPmer") has prepared this document in accordance with the client's instructions, for the client's sole purpose and use. No third party may rely upon this document without the prior and express written agreement of ABPmer. ABPmer does not accept liability to any person other than the client. If the client discloses this document to a third party, it shall make them aware that ABPmer shall not be liable to them in relation to this document. The client shall indemnify ABPmer in the event that ABPmer suffers any loss or damage as a result of the client's failure to comply with this requirement.

Sections of this document may rely on information supplied by or drawn from third party sources. Unless otherwise expressly stated in this document, ABPmer has not independently checked or verified such information. ABPmer does not accept liability for any loss or damage suffered by any person, including the client, as a result of any error or inaccuracy in any third party information or for any conclusions drawn by ABPmer which are based on such information.

All content in this document should be considered provisional and should not be relied upon until a final version marked '*issued for client use*' is issued.

All images on front cover copyright ABPmer.

## ABPmer

Quayside Suite, Medina Chambers, Town Quay, Southampton, Hampshire SO14 2AQ  
T: +44 (0) 2380 711844 W: <http://www.abpmer.co.uk/>

# Summary

Fair Isle is the United Kingdom's most remote community, lying 24 miles off the southern tip of the Shetland Islands. The island is connected to mainland Shetland by two lifeline transport links. The main passenger link is through an air service, but the existing ferry service provides the critically important supply chain and freight link as well as capacity for 12 passengers.

Shetland Island Council is progressing the Fair Isle Ferry Upgrade Project to replace the existing vessel, which is approaching the end of its life, together with ferry infrastructure at each of the berthing sites; North Haven Bay, on Fair Isle and at Grutness, near Sumburgh Head on the Shetland Isles. As such ecological surveys were required at these berthing sites to determine the baseline benthic habitats and species present.

ABPmer was commissioned to undertake benthic ecological surveys to characterise the habitats and species present at North Haven and Grutness. Intertidal and subtidal surveys were completed at both sites. Intertidal walkover surveys mapped the biotopes surrounding the piers/ quays and at the nearby beaches of both sites. Subtidal surveys, consisting of grab and underwater video operations, were similarly carried out in the marine environment within and around the footprint of the proposals for each site.

At North Haven the rocky intertidal areas consisted of a zonation of *Fucus vesiculosus*, *Fucus serratus* and *Laminaria digitata*, alongside a variety of red seaweeds and a rich faunal community. The majority of the nearby beach was formed of fine, clean, sand with *Arenicola* spp.. No Priority Marine Feature (PMF) habitats or species were identified within the intertidal areas at North Haven.

In the subtidal areas the site consisted of a mosaic of muddy sand and rocky kelp outcrops. These kelp outcrops were identified as *Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata (IR.MIR.KR.LhypTX), a component of the kelp bed PMF habitat. This PMF was patchy in extent, forming a mosaic with non-PMF biotopes.

No PMFs were identified within the intertidal environment at Grutness. The rocky areas of the shore followed a typical zonation from upper shore barnacle dominated littoral rock to *F. vesiculosus*, *F. serratus* and lower shore *L. digitata* and *Saccharina latissima* kelp communities. While the beach to the west of the study area was identified as barren littoral coarse sand.

In the subtidal, *Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata was similarly found but was also considered to be a relatively poor example of the PMF due to the patchy/ mosaic nature of the feature across the subtidal area.

There were also a variety of other non-PMF biotopes recorded at subtidal stations at Grutness including 'Mixed kelps with scour-tolerant and opportunistic foliose red seaweeds on scoured or sand-covered infralittoral rock', '*Alaria esculenta* on exposed sublittoral fringe bedrock' and 'Mixed *Laminaria hyperborea* and *Saccharina latissima* forest on sheltered upper infralittoral rock.'

No Invasive Non-Native Species (INNS) were recorded at either site.

# Contents

|     |                               |    |
|-----|-------------------------------|----|
| 1   | Introduction.....             | 1  |
| 1.1 | Overview.....                 | 1  |
| 1.2 | Objectives.....               | 1  |
| 2   | Methods.....                  | 2  |
| 2.1 | Sampling.....                 | 2  |
| 2.2 | Analysis.....                 | 6  |
| 3   | Results.....                  | 7  |
| 3.1 | North Haven, Fair Isle.....   | 7  |
| 3.2 | Grutness, Shetland Isles..... | 14 |
| 4   | Conclusions.....              | 21 |
| 5   | References.....               | 22 |
| 6   | Abbreviations/Acronyms.....   | 23 |

## Appendices

|     |                                  |    |
|-----|----------------------------------|----|
| A   | Subtidal Sample Locations.....   | 25 |
| B   | Subtidal Underwater Imagery..... | 26 |
| B.1 | North Haven, Fair Isle.....      | 26 |
| B.2 | Grutness, Shetland Isles.....    | 28 |
| C   | Subtidal Species List.....       | 30 |

## Tables

|           |   |    |
|-----------|---|----|
| Table 1.  | North Haven subtidal benthic grab survey results .....                  | 11 |
| Table 2.  | Grutness subtidal benthic grab survey results .....                     | 18 |
| Table A1. | Coordinates (WGS84) of sample locations at Fair Isle and Grutness ..... | 25 |
| Table B1. | Underwater imagery Fair Isle.....                                       | 26 |
| Table B2. | Underwater imagery Grutness .....                                       | 28 |
| Table C1. | Species identified from grab samples at Fair Isle and Grutness.....     | 30 |

## Figures

|            |   |    |
|------------|---|----|
| Figure 1.  | Survey locations at North Haven, Fair Isle .....  | 3  |
| Figure 2.  | Survey locations at Grutness, Shetland Isles .....  | 4  |
| Figure 3.  | A) Van Veen grab sampling, B) <i>Chasing M2 Pro</i> Remotely Operated Underwater Vehicle (ROV).....   | 5  |
| Figure 4.  | Under canopy flora and fauna: juvenile <i>Cancer pagurus</i> and red seaweeds <i>Mastocarpus stellatus</i> and <i>Ceramium</i> spp. ....  | 7  |
| Figure 5.  | Distribution of intertidal habitats identified on the Phase 1 survey at North Haven, Fair Isle .....  | 8  |
| Figure 6.  | Biotores identified at North Haven, Fair Isle: A) polychaetes in littoral fine sand; B) <i>Semibalanus balanoides</i> on exposed to moderately exposed or vertical sheltered eulittoral rock; C) <i>Fucus serratus</i> and red seaweeds on moderately exposed lower eulittoral rock; D) <i>Laminaria digitata</i> and under-boulder fauna on sublittoral fringe boulders..... | 9  |
| Figure 7.  | Caves identified at North Haven, Fair Isle .....  | 10 |
| Figure 8.  | <i>Laminaria hyperborea</i> forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata present at stations FIG01 and FIG02. ....   | 12 |
| Figure 9.  | A) <i>Laminaria hyperborea</i> forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata (IR.MIR.KR.LhypTX) and B) <i>Arenicola marina</i> in infralittoral fine sand or muddy sand (SS.SSa.IMuSa.AreISa). ....   | 12 |
| Figure 10. | Distribution of subtidal biotores at North Haven, Fair Isle.....  | 13 |
| Figure 11. | Rocky shore to the east of Grutness ferry terminal.....   | 14 |
| Figure 12. | Distribution of intertidal habitats identified on the Phase 1 survey at Grutness, Shetland Isles .....  | 15 |
| Figure 13. | Rocky shore to the west of Grutness ferry terminal.....   | 16 |
| Figure 14. | A) Barren littoral coarse sand beach to the west of Grutness ferry terminal; B) rocky outcrop to the south of the beach .....   | 17 |
| Figure 15. | A) <i>Alaria esculenta</i> on exposed sublittoral fringe bedrock present at stations GG01; B) <i>Laminaria hyperborea</i> forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata present at stations GG03.....   | 19 |
| Figure 16. | A and B) <i>Laminaria hyperborea</i> forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata (IR.MIR.KR.LhypTX); C) Infralittoral mobile clean sand with sparse fauna (SS.SSa.IFiSa.IMoSa) and D) Mixed kelps with scour-tolerant and opportunistic foliose red seaweeds on scoured or sand-covered infralittoral rock (IR.HIR.KSed.XKScrR) .....   | 19 |
| Figure 17. | Distribution of subtidal biotores at Grutness, Shetland Isles .....   | 20 |



# 1 Introduction

## 1.1 Overview

Fair Isle is the United Kingdom's most remote community, lying 24 miles off the southern tip of the Shetland Islands. The island is separated from Shetland mainland by a body of water known as the 'Roost', which has a reputation of being one of the most demanding stretches of water in the UK, and indeed Europe. This means that the island is not just geographically remote but is also remote from a connectivity perspective – indeed, the island had no transport connections on 221 days in 2017.

The island is within the Shetland Islands Council (SIC) administrative area and is connected to mainland Shetland by two lifeline transport links. The main passenger link is through an air service by means of an eight seat Britten-Norman BN-2 Islander aircraft. The existing ferry service provides the critically important supply chain and freight link as well as capacity for 12 passengers per sailing.

SIC is progressing the Fair Isle Ferry Upgrade Project ('the Project') to replace the existing vessel, together with upgrading ferry infrastructure at each of the berthing sites; North Haven Bay, on Fair Isle and at Grutness, near Sumburgh Head on the Shetland Isles.

## 1.2 Objectives

The Fair Isle and Grutness sites are both located within environmental designations including Special Protection Areas (SPA) and a Special Area of Conservation (SAC) (North Haven, Fair Isle). As such ecological surveys are required at both of the berthing sites to determine the baseline benthic habitats and species present.

ABPmer was commissioned to undertake benthic ecological surveys to characterise the habitats and species present at North Haven and Grutness.

This report describes the survey methods used to monitor the intertidal and subtidal habitats and benthic invertebrate assemblage(s) present within the vicinity of the project and provides a summary of the survey results.

## 2 Methods

In order to characterise the habitats and species present within and adjacent to the proposed works, at North Haven and Grutness, intertidal and subtidal surveys were carried out. The methods for each are described in more detail below.

### 2.1 Sampling

#### 2.1.1 Intertidal

Phase 1 intertidal habitat surveys were undertaken at both North Haven, Fair Isle and at Grutness, on the 11 and 16 July, respectively.

The surveys were undertaken at low water and coincided with a spring tidal phase. The survey approach was based on the standardised Phase 1 mapping methodology as detailed in the Marine Monitoring Handbook, Procedural Guidance No 3-1 (Wyn and Brazier, 2001) and Countryside Council for Wales (CCW) Handbook for Marine Intertidal Phase 1 Survey and Mapping (Wyn *et al.*, 2000). Habitats in the area were mapped using a hand-held Global Positioning System (GPS) and described in accordance with the Marine Habitat Classification for Britain & Ireland (MHCBI) v22.04) to biotope class levels 4 or 5 (JNCC, 2022). Any characterising or rare/ scarce species were also noted as well as any evidence of anthropogenic disturbance

The habitats recorded in the surveys are described in more detail in Section 3 below. The spatial distribution of intertidal habitats that have been mapped and the distribution of biotopes identified from the subtidal samples are shown in the figures in Section 3.

In addition, an unmanned aerial vehicle (UAV) or drone, the '*DJI Mavic 3*', was flown at North Haven, Fair Isle to obtain aerial imagery of the site. The drone could not be used at Grutness due to flight restrictions as a result of the sites proximity to Sumburgh airport.

#### 2.1.2 Subtidal

Subtidal benthic surveys were conducted on board the '*Ruby May*' at Grutness on the 14 July and Fair Isle on the 16 July. The subtidal surveys utilised a combination of grab sampling and underwater video to characterise the benthic habitats and species. Sampling was conducted at 10 stations, four grab and six video, at both Fair Isle and Grutness, the locations of which are shown in Figure 1 and Figure 2, respectively, and coordinates provided in Appendix A.

Due to the presence of nesting Fulmar on the stack (nestled between the breakwater) at the Fair Isle site, operations maintained a minimum distance of 20 m from the breakwater to prevent disturbance to the nesting sites. The 20 m buffer zone is shown Figure 1 and all survey locations were situated outwith the buffer area.

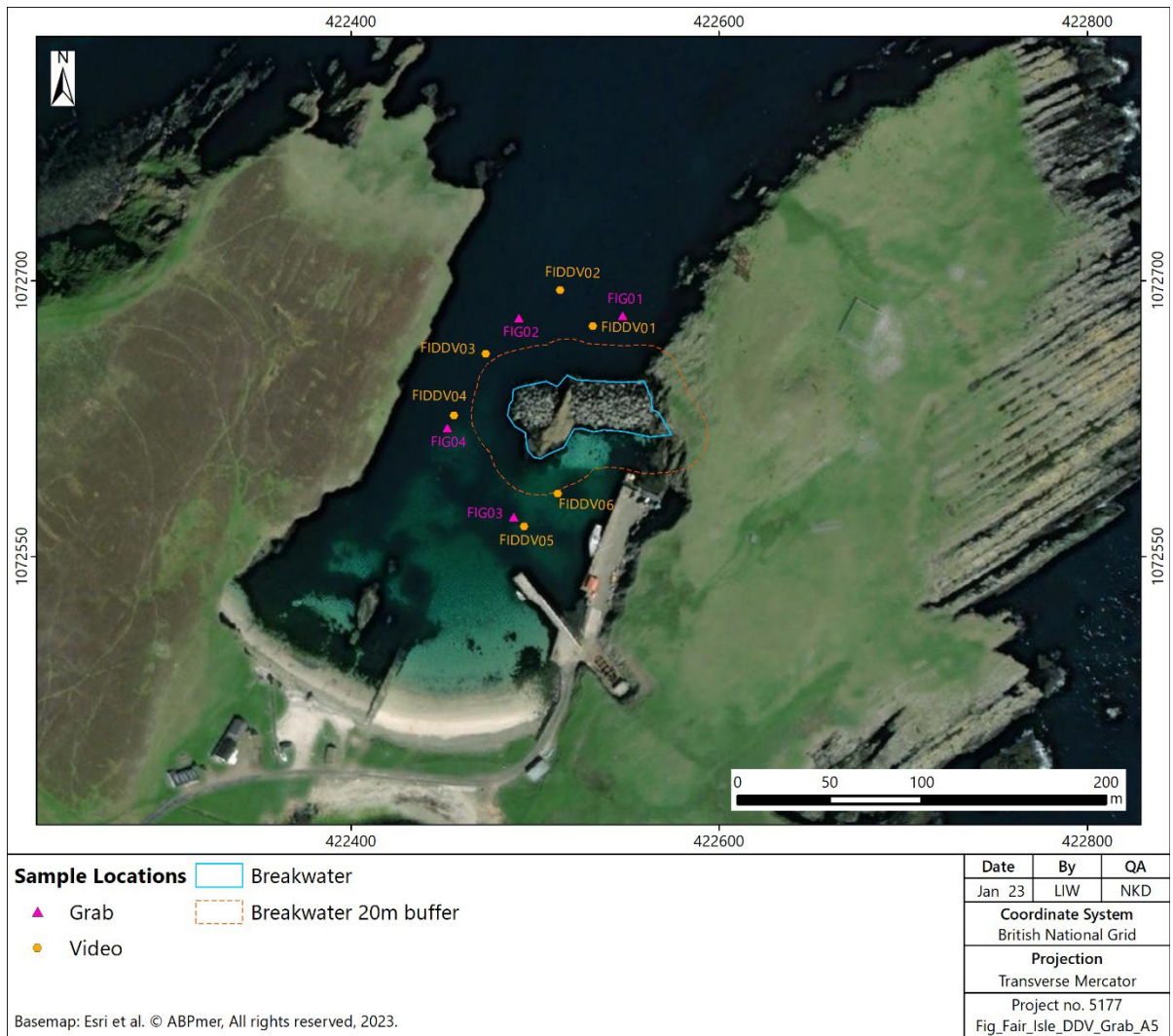


Figure 1. Survey locations at North Haven, Fair Isle

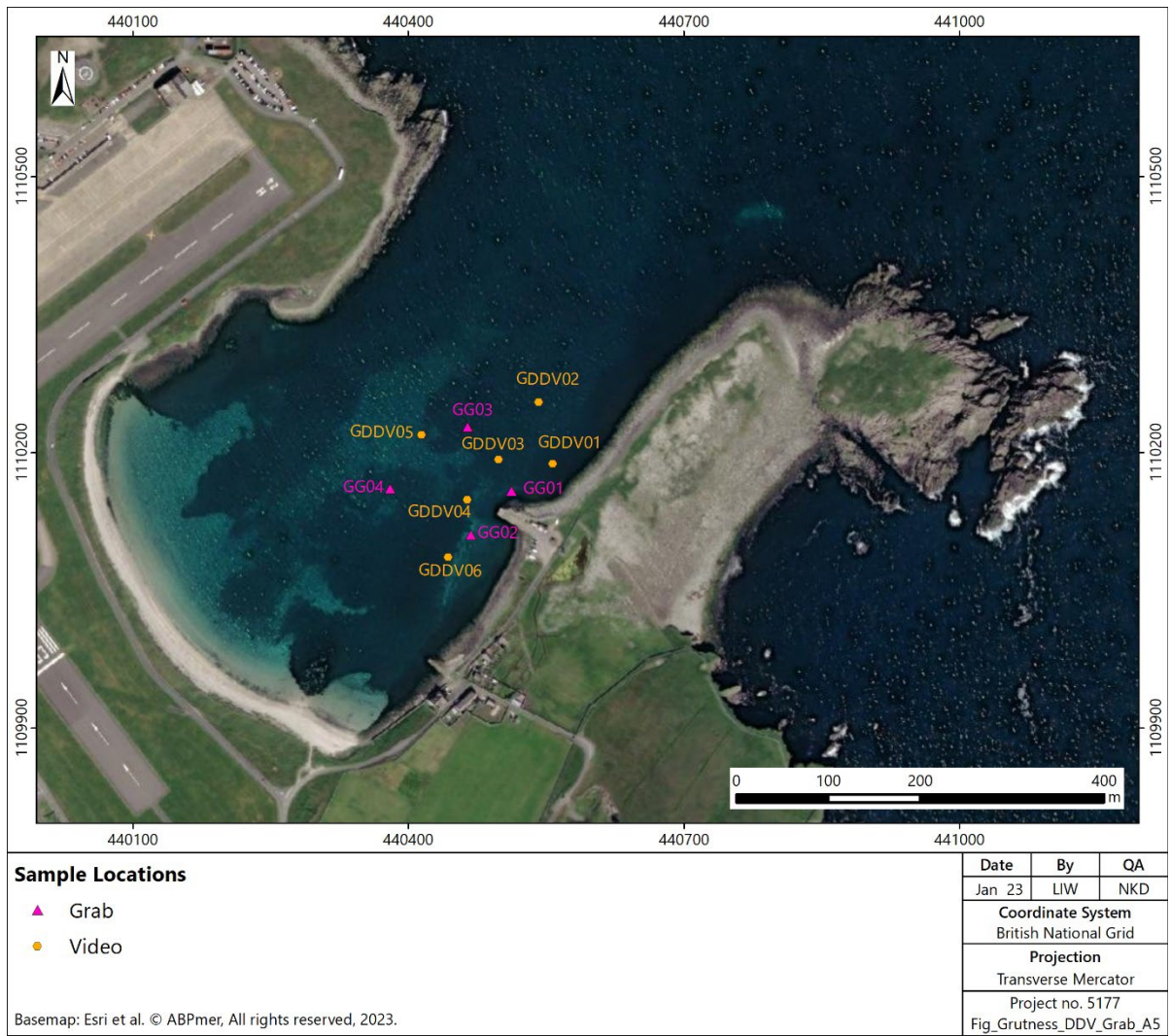


Figure 2. Survey locations at Grutness, Shetland Isles



## Grab sampling

Sampling at Fair Isle and Grutness was carried out using a 0.1 m<sup>2</sup> Van Veen grab deployed from the stern of the survey vessel (Figure 3A). Single grab samples were collected at each of the 4 stations at each site for macrofauna analysis (faunal composition, abundance and biomass).

Following successful deployment, the grab sample was decanted into a suitable container and photographed. If the sample volume was >5 L a representative sub-sample of sediment, approximately 500 ml was taken for Particle Size Analysis (PSA) and Total Organic Carbon (TOC) determination. A note was made of the volume of sample obtained prior to sieving along with supplementary information about the sediment composition. The sample was then discharged onto a sieving table and then gently washed over a 1 mm sieve using seawater to remove excess substrate.



Figure 3. A) Van Veen grab sampling, B) Chasing M2 Pro' Remotely Operated Underwater Vehicle (ROV)

The residue was photographed before being transferred into a labelled sample container and preserved in 4% buffered formalin solution before being sent to a National Marine Biological Analytical Quality Control (NMBAQC) accredited laboratory for processing. The PSA and TOC sediment samples were placed into a labelled sample bag.

If the sediment volume was <5 L, the material was discarded. At each station, up to 3 attempts were made to retrieve a sample containing sufficient volume for analysis. If a suitable sample could not be attained the ROV was deployed to obtain imagery of the seabed.

## Underwater video

Six video stations were surveyed at each site using a 'Chasing M2 Pro' Remotely Operated Underwater Vehicle (ROV) deployed from the stern of the vessel (Figure 3B). The vessel was manoeuvred to location and the ROV deployed to just above the seabed to prevent damage or interaction with the seabed. The ROV was then flown within a 10 m radius to obtain representative images of the seabed. A live feed from the ROV to a mobile device allowed real time viewing of footage. All footage was geo-referenced to allow suitable habitat mapping.

## 2.2 Analysis

### 2.2.1 Faunal analysis

Infaunal samples were analysed by Marine Scope Taxonomy, an accredited NMBAQC laboratory.

Faunal samples were sieved over a 1 mm mesh to remove fauna and residue less than 1 mm. Samples were then sorted from the sieve residue using low power binocular microscopes. All of the macroinfaunal specimens were identified to species level (where practicable), enumerated and biomassed. This work was undertaken in adherence with International Organization for Standardization (ISO) 16665 standards and the NMBAQC Scheme Guidelines (Worsfold *et al.*, 2010).

QA of the faunal analysis was undertaken internally by Marine Scope Taxonomy. Following the NMBAQC guidelines, 10 % of samples were re-analysed for extraction, identification and enumeration. All samples passed QA checks and no remedial action was required.

Infauna samples were subsequently assigned biotopes to a minimum Level 3 (Connor *et al.* 2004). Raw data from the faunal analysis are shown in Appendix C.

### 2.2.2 PSA analysis

The PSA sample analysis was undertaken by ABPmer using the NMBAQC standardised methodology. The analysis was carried out using a Mastersizer laser diffractor which produces detailed sedimentary profiles for fine sediments (clay, sand and silts).

PSA data were standardised to Wentworth (1922) size classes for each station. Sediment classifications for mean particle size data at each station were calculated using GRADISTAT (Blott and Pye, 2001). Results of the PSA are shown in Appendix B.

### 2.2.3 Data processing

Following the completion of the survey, the extent of biotopes recorded in the area were mapped into Geographical Information System (GIS) layers using ArcGIS and the positional information derived from the GPS readings. All maps used a WGS84 datum.

Post processing of the imagery also included mapping of sampling locations with an indication of biotope/habitat present at each station. Records were made of notable fauna, Priority Marine Features (PMF's) such as kelp beds and the presence of any invasive non-native species (INNS).

A habitat map for the site was then produced by analysing and interpreting the available habitat data (as detailed above). The results of the analysis are presented in Section 3 below.

## 3 Results

### 3.1 North Haven, Fair Isle

#### 3.1.1 Intertidal habitats

##### Rock armour

The species on the upper-mid section of the rock armour surrounding the pier/ quay at North Haven consisted of a mosaic of bladder wrack *Fucus vesiculosus* (LR.LLR.F.Fves.FS: *Fucus vesiculosus* on full salinity moderately exposed to sheltered mid eulittoral rock) and serrated wrack *F. serratus* (LR.LLR.F.Fserr.FS: *Fucus serratus* on full salinity sheltered lower eulittoral rock).

The lower part of the rock armour in this area was characterised by a zone of kelp/ oarweed *Laminaria digitata* (IR.MIR.KR.Ldig.Bo *Laminaria digitata* and under-boulder fauna on sublittoral fringe boulders; Figure 5). Beneath the canopy a variety of red seaweeds such as false Irish moss *Mastocarpus stellatus*, *Palmaria palmata* and *Ceramium spp.* were present alongside a rich faunal community including the presence of juvenile edible crab *Cancer pagurus* (Figure 4).



Figure 4. Under canopy flora and fauna: juvenile *Cancer pagurus* and red seaweeds *Mastocarpus stellatus* and *Ceramium spp.*



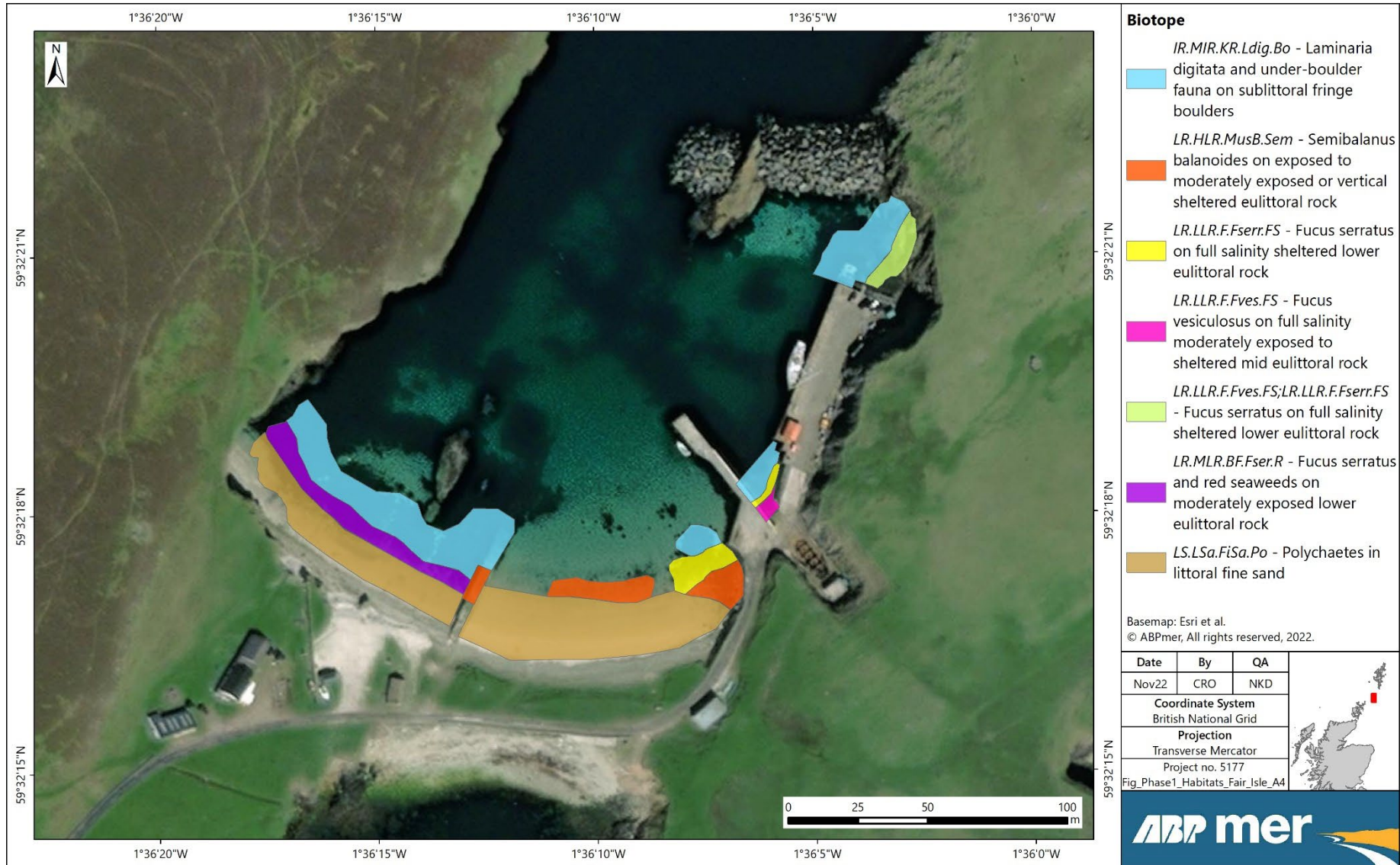


Figure 5. Distribution of intertidal habitats identified on the Phase 1 survey at North Haven, Fair Isle



## Beach

The majority of the nearby beach at Fair Isle was formed of fine, clean, sand across the extent of the beach with the presence of *Arenicola sp.* worm casts at approximately 10-15 per m<sup>2</sup> within the mid shore. As such this area was classified as polychaetes in littoral fine sand (LS.LSa.FiSa.Po). Above this zone, barren littoral rock was present which formed part of the strandline. No fauna were visible within this zone (Figure 6A).

Within the centre of the beach a concrete slipway was present. On the mid-zone of the slipway barnacles dominated with the limpet *Patella vulgata* and occasional *Fucus spiralis*, *Ulva sp.* and *Nemalion helminthoides* (Figure 6B), classified as LR.HLR.MusB.Sem *Semibalanus balanoides* on exposed to moderately exposed or vertical sheltered eulittoral rock.

To the western extent of the beach, boulders and rock within the lower shore were covered in a range of algae species including *F. serratus* and red seaweeds such as *M. stellatus* and *Ceramium spp.*. The green seaweeds *U. intestinalis* and *U. lactuca* were also present. This habitat was most appropriately assigned to LR.MLR.BF.Fser.R *Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock (Figure 6C). Extending below this zone *L. digitata* predominated with a diversity of red seaweeds and epifaunal species, most appropriately classified as IR.MIR.KR.Ldig.Bo *Laminaria digitata* and under-boulder fauna on sublittoral fringe boulders (Figure 6D).



Figure 6. Biotopes identified at North Haven, Fair Isle: A) polychaetes in littoral fine sand; B) *Semibalanus balanoides* on exposed to moderately exposed or vertical sheltered eulittoral rock; C) *Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock; D) *Laminaria digitata* and under-boulder fauna on sublittoral fringe boulders

Within the wider area at North Haven a number of sea caves were also identified (Figure 7.)





Figure 7. Caves identified at North Haven, Fair Isle

### 3.1.2 Subtidal habitats

The sediments from grab samples collected within North Haven consisted of predominantly muddy sand. However, only two of the four samples (FIG03 and FIG04) could be obtained due to the presence of cobble substrate. Where grabs could not be obtained, underwater imagery was collected to classify the habitats at the site.

In total, 40 taxa were recorded from samples FIG03 and FIG04, ranging from 26 at FIG03 and 27 at FIG04. The faunal assemblage at FIG03 were predominantly characterised by polychaetes (*Malacoceros vulgaris*, *Capitella spp.* and *Spio martinensis*), the crustacea *Dexamine thea* and *Nototropis guttatus* and Nematoda (Table 1).

Table 1. North Haven subtidal benthic grab survey results

| Station | Sediment Type | Depth (mBCD) | No. of Taxa (0.1 m <sup>2</sup> ) | No. of Individuals (0.1 m <sup>2</sup> ) | Total Biomass (g per m <sup>2</sup> ) | Key Characterising Species (Number per sample shown in brackets)  | Identified Biotope      | Site Image  |
|---------|---------------|--------------|-----------------------------------|--|---------------------------------------|---|-------------------------|---|
| FIG01   | Cobbles       | 6.3          | No successful grab samples        |  |                                       | <i>Laminaria hyperborea</i><br><i>Laminaria digitata</i><br><i>Saccharina latissima</i><br><i>Lithothamnion sp.</i>   | IR.MIR.KR.L<br>hypTX.Ft |  |
| FIG02   | Cobbles       | 11.5         | No successful grab samples        |  |                                       | <i>Laminaria hyperborea</i><br><i>Laminaria digitata</i><br><i>Saccharina latissima</i><br><i>Lithothamnion sp.</i>   | IR.MIR.KR.L<br>hypTX.Ft |  |
| FIG03   | Sand          | 5.7          | 26                                | 959                                      | 79.1                                  | Polychaeta <i>Malacoceros vulgaris</i> (319)<br>Polychaeta <i>Capitella</i> spp. (270)<br>Crustacea <i>Dexamine thea</i> (85)<br>NEMATODA (73)<br>Polychaeta <i>Spio martinensis</i> (56)           | SS.SSa.IMu<br>Sa        | No image  |
| FIG04   | Sand          | 6.4          | 27                                | 407                                      | 23.1                                  | NEMATODA (170)<br>Polychaeta <i>Capitella</i> spp. (53)<br>Crustacea <i>Bathyporeia pelagica</i> (33)<br>Crustacea <i>Periocolodes longimanus</i> (26)<br>Crustacea <i>Nototropis guttatus</i> (23) | SS.SSa.IMu<br>Sa        | No image  |



The fauna at FIG04 were predominantly characterised by Nematoda, crustacean species (*Bathyporeia pelagica*, *Pericolodes longimanus* and *Nototropis guttatus*) and the polychaete *Capitella* spp.. No INNS were recorded within either sample. Biomass at both stations was dominated by Annelida.

At FIG01 and FIG02 where no successful grab samples could be obtained underwater imagery was utilised. The imagery identified dense kelp of *Laminaria hyperborea* with *Laminaria digitata* and *Saccharina latissima* on mixed cobble, pebble substrate (Figure 8). Foliose red seaweeds were also present on kelp stipes.

This habitat was identified as *Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata (IR.MIR.KR.LhypTX) which is a component biotope of the kelp bed PMF. This PMF was patchy in extent and presence, recorded primarily as a mosaic with non-PMF biotopes.

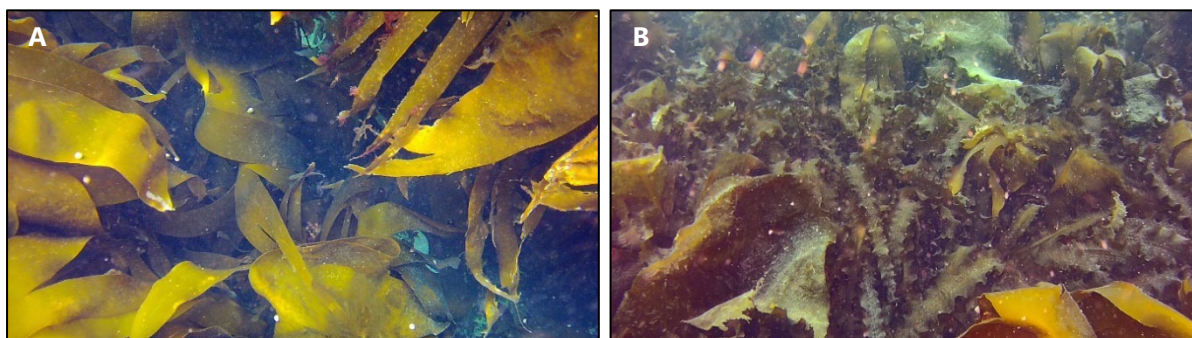


Figure 8. *Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata present at stations FIG01 and FIG02.

At the underwater video stations two dominant biotopes were identified; *Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata (IR.MIR.KR.LhypTX) and *Arenicola marina* in infralittoral fine sand or muddy sand (SS.SSa.IMuSa.AreISa), Figure 9A and Figure 9B respectively.

In addition, at station FIDDV02 a mosaic of Mixed *Laminaria hyperborea* and *Saccharina latissima* on sheltered infralittoral rock (IR.LIR.K.LhypSlat) and Infralittoral muddy sand (SS.SSa.IMuSa) were observed.

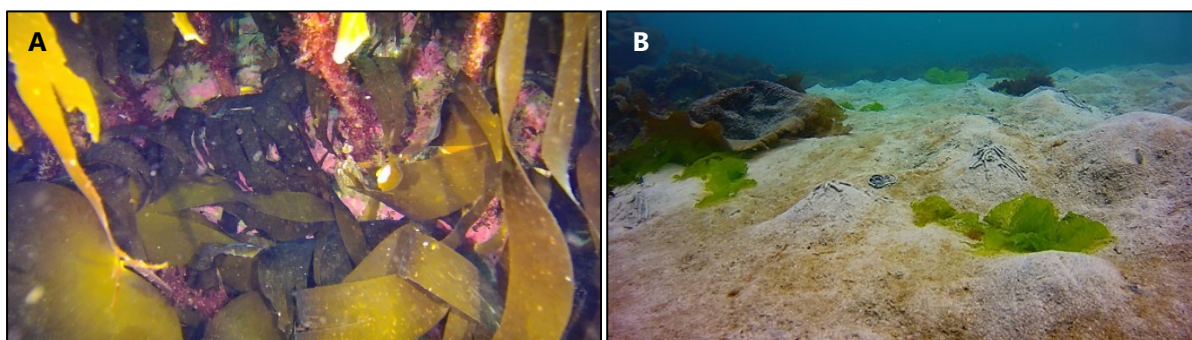


Figure 9. A) *Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata (IR.MIR.KR.LhypTX) and B) *Arenicola marina* in infralittoral fine sand or muddy sand (SS.SSa.IMuSa.AreISa).



The distribution of biotopes identified during the subtidal survey are shown in Figure 10.



Figure 10. Distribution of subtidal biotopes at North Haven, Fair Isle

## 3.2 Grutness, Shetland Isles

### 3.2.1 Intertidal habitats

#### Rocky shore

The upper shore on the rocky shore to the east of Grutness terminal was dominated by spiral wrack *Fucus spiralis* and the ephemeral green seaweed *Ulva intestinalis* (LR.MLR.BF.FspiB *Fucus spiralis* on exposed to moderately exposed upper eulittoral rock). Above this zone, green algae with occasional lichens were present on predominantly barren supralittoral rock (LR.FLR.Lic: Lichens or small green algae on supralittoral and littoral fringe rock; Figure 11).

To the mid shore *Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock (LR.MLR.BF.FvesB) and *F. serratus* on moderately exposed lower eulittoral rock (LR.MLR.BF.Fser) formed a mosaic across a very thin band along the shore. Below this *Laminaria digitata* on moderately exposed sublittoral fringe bedrock (IR.MIR.KR.Ldig.Ldig) was present (Figure 12).



Figure 11. Rocky shore to the east of Grutness ferry terminal





Figure 12. Distribution of intertidal habitats identified on the Phase 1 survey at Grutness, Shetland Isles



To the west of the Grutness ferry terminal the upper shore was dominated by barnacles and limpets LR.HLR.MusB.Sem.Sem *Semibalanus balanoides*, *Patella vulgata* and *Littorina* spp. on exposed to moderately exposed or vertical sheltered eulittoral rock (Figure 13).

As with the biotopes observed to the east, the characterising species observed on the mid-section of the shore were *Fucus vesiculosus* and *F. serratus*, however on the western side these formed two distinct bands as opposed to a mosaic. With *Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock (LR.MLR.BF.FvesB) above *F. serratus* on moderately exposed lower eulittoral rock (LR.MLR.BF.Fser) (Figure 12).

In the lower shore kelp predominated with both *Laminaria digitata* and *Saccharina latissima* equally abundance. Red seaweeds were present below the algal canopy. This habitat was most appropriately assigned to IR.LIR.K.Slat.Ldig *Saccharina latissima* and *Laminaria digitata* on sheltered sublittoral fringe rock.



Figure 13. Rocky shore to the west of Grutness ferry terminal

## Beach

To the far west of the Grutness ferry terminal the beach was formed predominantly of Barren littoral coarse sand (LS.LSa.MoSa.BarSa) with little evidence of any infauna. A small rocky outcrop was present to the southern end of the beach where *L. digitata* and *F. serratus* were present with abundant red seaweeds such as *M. stellatus* and *Membranoptera alata*. This habitat was most appropriately assigned to IR.MIR.KR.Ldig.Ldig *Laminaria digitata* on moderately exposed sublittoral fringe bedrock

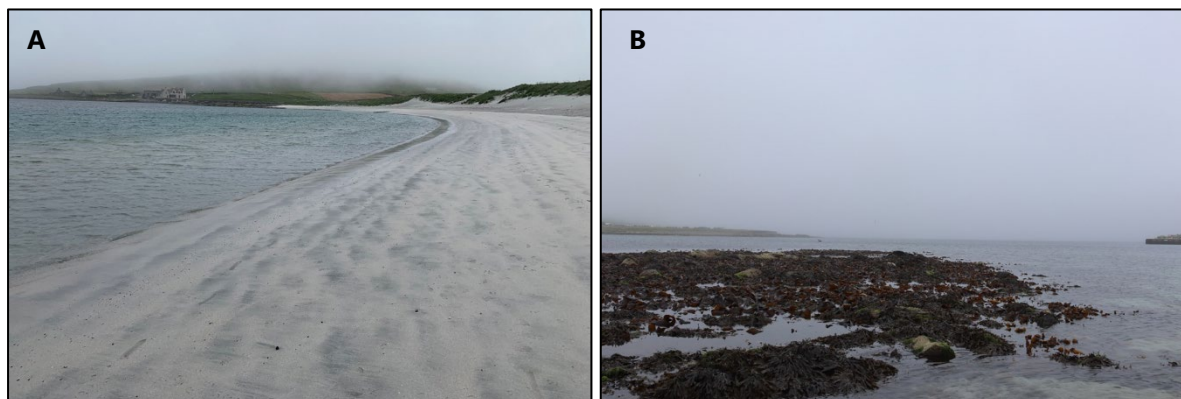


Figure 14. A) Barren littoral coarse sand beach to the west of Grutness ferry terminal; B) rocky outcrop to the south of the beach

### 3.2.2 Subtidal habitats



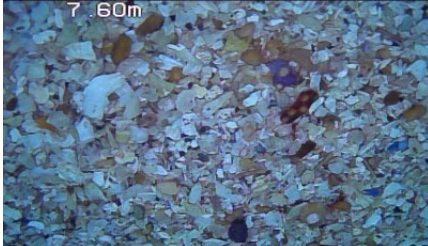
The sediments from grab samples collected at Grutness predominantly consisted of sand. However, only two of the four samples (GG02 and GG04) could be obtained due to the presence of cobbles. Where grabs could not be obtained, underwater imagery was collected to classify the habitats at the site.

In total, 62 taxa were recorded from samples GG02 and GG04, ranging from 28 at GG02 to 46 at GG04. The faunal assemblage at GG02 were predominantly characterised by Nematoda and oligochaete species (*Tubificoides benedii* and *T. pseudogaster*), the polychaetes *Cirriformia* spp. and *Cirriformia tentaculata* (Table 2). The fauna at GG04 were predominantly characterised by Nematoda, Copepoda, *T. pseudogaster*, *C. tentaculata* and *Gammaridae*. No INNS were recorded for either sample, however, the small sea cucumber *Rhabdomolgus ruber* was recorded at GG04. This species is thought to be rare, although it is potentially under recorded due to its small size. Biomass at both stations was dominated by Annelida.

At GG01 and GG03, where no successful grab samples could be obtained, underwater imagery was utilised. The imagery identified high density of the kelp *Alaria esculenta*; with encrusting coralline algae and a red seaweed understory including species such as *Membranoptera alata* at GG01. This was best categorised as *Alaria esculenta* on exposed sublittoral fringe bedrock (IR.HIR.KFaR.AI).

Dense *Laminaria hyperborea* with *Saccharina latissima* were present on a mixed cobble and pebble substrata. The stipes of these kelps were covered with foliose red seaweeds at GG03 (Figure 15). This biotope was identified as '*Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata (IR.MIR.KR.LhypTX)', which is a component biotope of the kelp bed PMF. This PMF was patchy in extent and presence, recorded primarily as a mosaic with non-PMF biotopes.

Table 2. Grutness subtidal benthic grab survey results

| Station | Sediment Type      | Depth (mBCD) | No. of Taxa (0.1 m <sup>2</sup> ) | No. of Individuals (0.1 m <sup>2</sup> ) | Total Biomass (g per m <sup>2</sup> ) | Key Characterising Species (Number per sample shown in brackets)   | Identified Biotope      | Site Image  |
|---------|--------------------|--------------|-----------------------------------|--|---------------------------------------|--|-------------------------|---|
| GG01    | Cobbles and gravel | 5.3          | No successful grab samples        |  |                                       | <i>Alaria esculenta</i><br><i>Laminaria digitata</i><br><i>Saccharina latissima</i><br><i>Lithothamnion sp.</i>  | IR.HIR.KFaR.<br>Al      |    |
| GG02    | Gravelly Sand      | 5.0          | 28                                | 510                                      | 54.5                                  | Nematoda (349)<br>Oligochaete <i>Tubificoides benedii</i> (45)<br>Oligochaete <i>Tubificoides pseudogaster</i> (27)<br>Polychaeta <i>Cirriformia</i> (23)<br>Polychaeta <i>Cirriformia tentaculate</i> (16)<br>Nemertea (13) | SS.SSa.IFiSa.l<br>MoSa  | No image  |
| GG03    | Cobbles and gravel | 6.0          | No successful grab samples        |  |                                       | <i>Laminaria hyperborea</i><br><i>Saccharina latissima</i>   | IR.MIR.KR.Lh<br>ypTX.Ft |   |
| GG04    | Gravelly Sand      | 6.2          | 46                                | 847                                      | 104.8                                 | Nematoda (367)<br>Copepoda (63)<br>Oligochaete <i>Tubificoides pseudogaster</i> (61)<br>Polychaeta <i>Cirriformia tentaculate</i> (51)<br>Gammaridae (51)<br>Amphipoda <i>Jassa falcata</i> (43)                             | SS.SSa.IFiSa.l<br>MoSa  |  |



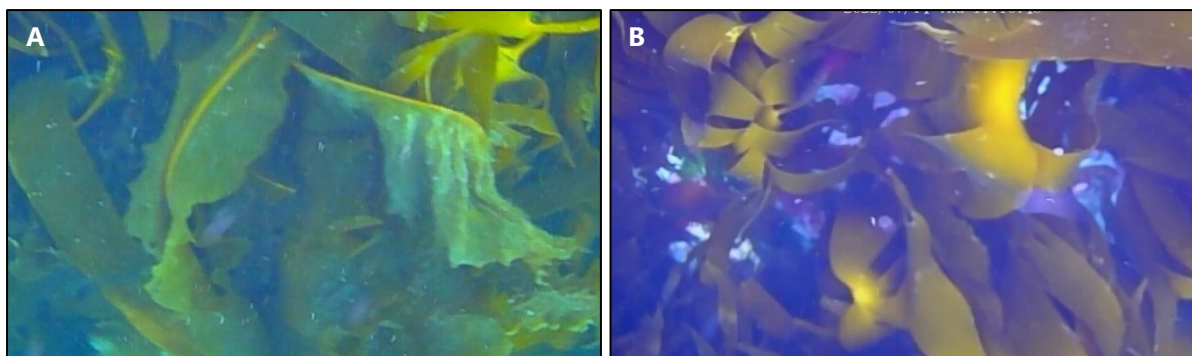


Figure 15. A) *Alaria esculenta* on exposed sublittoral fringe bedrock present at stations GG01; B) *Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata present at stations GG03.

At the underwater video stations a number of biotopes were identified. These included 'mixed kelps with scour-tolerant and opportunistic foliose red seaweeds on scoured or sand-covered infralittoral rock (IR.HIR.KSed.XKScrR) at GDDV01 and GDDV02 where it formed a matrix with *Alaria esculenta* on exposed sublittoral fringe bedrock (IR.HIR.KFaR.AI). The biotope 'mixed *Laminaria hyperborea* and *Saccharina latissima* forest on sheltered upper infralittoral rock (IR.LIR.K.LhypSlat.Ft)' was recorded at GDDV03 and the biotope 'infralittoral mobile clean sand with sparse fauna (SS.SSa.IFiSa.IMoSa)', at GDDV05.

The PMF habitat *Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata (IR.MIR.KR.LhypTX.Ft) was recorded at GDDV04 and GDDV06, but as with GG03 this was considered a poor example of the feature (Figure 16).

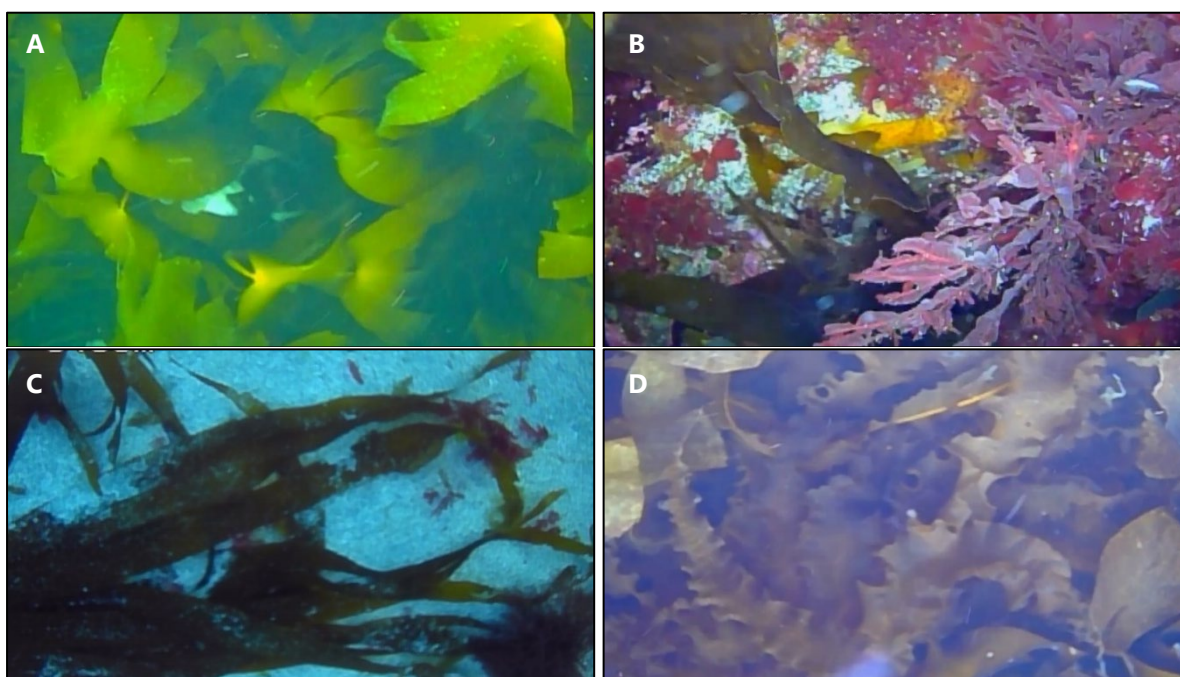


Figure 16. A and B) *Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata (IR.MIR.KR.LhypTX); C) Infralittoral mobile clean sand with sparse fauna (SS.SSa.IFiSa.IMoSa) and D) Mixed kelps with scour-tolerant and opportunistic foliose red seaweeds on scoured or sand-covered infralittoral rock (IR.HIR.KSed.XKScrR)

The distribution of biotopes identified during the subtidal survey are shown in Figure 17.

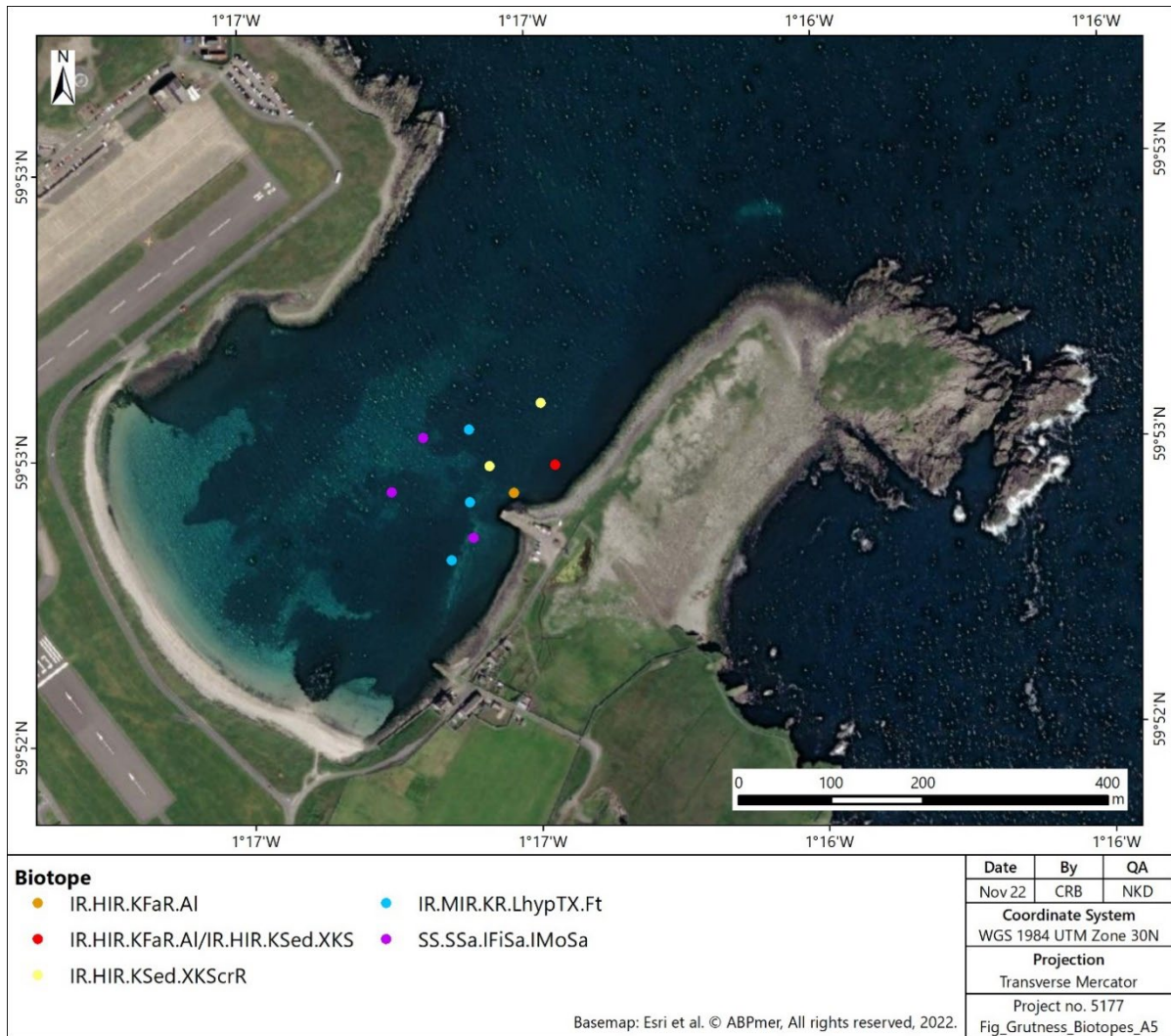


Figure 17. Distribution of subtidal biotopes at Grutness, Shetland Isles

## 4 Conclusions

Intertidal and subtidal surveys were successfully completed at Grutness, Shetland and North Haven, Fair Isle. Intertidal walk over surveys mapped the biotopes present on rocky areas surrounding the piers/quays and the nearby beaches at both sites. Subtidal surveys consisted of grab and underwater video operations. The results provide a greater insight into the current ecological status of North Haven and Grutness.

At Fair Isle the rocky intertidal areas consisted of a zonation of *F. vesiculosus*, *F. serratus* and *L. digitata*, beneath the canopy of which was a variety of red seaweeds alongside a rich faunal community. The majority of the nearby beach was formed of fine, clean, sand across the extent of which were *Arenicola* spp. worm casts. Boulders and rock within the lower shore were covered in a range of algae species including *F. serratus*, red seaweeds, *Ulva* spp. and *L. digitata*. No PMF habitats or species were identified within the intertidal areas at Fair Isle.

In the subtidal areas the site consisted of a mosaic of muddy sand and rocky kelp outcrops. These kelp outcrops were identified as *Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata (IR.MIR.KR.LhypTX) a component of the kelp bed PMF habitat. However, due to the very patchy extent and presence of this feature, it being found primarily as a mosaic with non-PMF biotopes at the site, this is considered a relatively poor example of this PMF.

As with Fair Isle, no PMFs were identified within the intertidal zone at Grutness. The rocky areas of the shore followed a typical zonation from upper shore barnacle dominated littoral rock to *F. vesiculosus*, *F. serratus* and lower shore *L. digitata* and *S. latissima* kelp communities. The beach to the far west of the area was identified as barren littoral coarse sand.

In the subtidal, *Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata was recorded. This was identified at stations GG03, GDDV04 and GDDV06 but was also considered to be a relatively poor example of the PMF due to its patchy extent and presence within the subtidal area.

There were also a variety of other non-PMF biotopes recorded at subtidal stations at Grutness including Mixed kelps with scour-tolerant and opportunistic foliose red seaweeds on scoured or sand-covered infralittoral rock, *Alaria esculenta* on exposed sublittoral fringe bedrock and Mixed *Laminaria hyperborea* and *Saccharina latissima* forest on sheltered upper infralittoral rock.

Within the inner bay at North Haven, the habitats are dominated by sandy substrata a likely result of the breakwater. While beyond the breakwater cobble substrate and kelp dominated biotopes predominate. Other than the effects from the breakwater at North Haven there was no evidence of anthropogenic activities impacting habitat distribution at either site. No INNS were recorded at either site (Grutness/North Haven).



## 5 References

Blott, S.J. and Pye, K. (2001) GRADISTAT: a grain size distribution and statistics package for the analysis of unconsolidated sediments. *Earth Surface Processes and Landforms* 26, 1237-1248.

Connor, D.W., J.H. Allen, N. Golding, K.L. Howell, L.M. Lieberknecht, K.O. Northen and J.B. Reker (2004) *The Marine Habitat Classification for Britain and Ireland Version 04.05* ISBN 1 861 07561 8. Available from: <https://mhc.jncc.gov.uk/resources#version0405>

ISO 16665: Water quality - Guidelines for quantitative sampling and sample processing of marine soft-bottom macrofauna. International Organization for Standardization.

JNCC (2022) *The Marine Habitat Classification for Britain and Ireland Version 22.04*. Available from: <https://mhc.jncc.gov.uk/>

Wentworth, C.K., (1922) A scale of grade and class terms for clastic sediments. *The Journal of Geology*, 30(5), pp.377-392.

Worsfold, T.M., Hall, D.J. and O'Reilly, M. (Ed.) (2010) *Guidelines for processing marine macrobenthic invertebrate samples: a Processing Requirements Protocol: Version 1.0*, June 2010. Report to the NMBAQC Committee. June 2010.

Wyn G., Brazier P. (2001). *Procedural Guideline No. 3-1. In situ biotope recording*. Marine Monitoring Handbook.

Wyn, G., Brazier, P., Birch, K., Bunker, A., Cooke, A., Jones, M., Lough, N., McMath, A. and Roberts, S. (2000) *Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey*. CCW, Bangor.

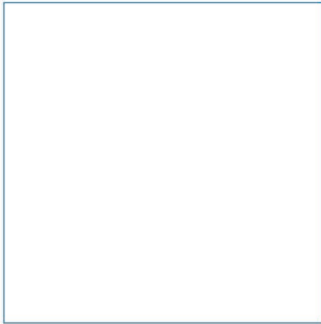
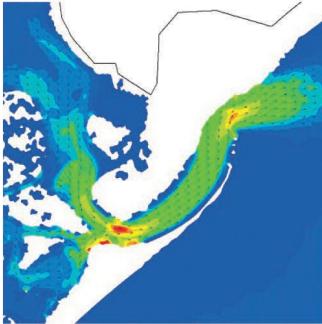
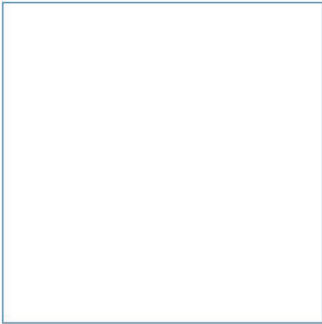
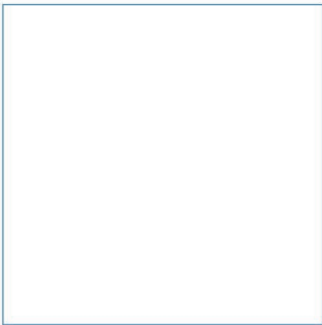
## 6 Abbreviations/Acronyms

|           |  |
|-----------|--|
| BN        | Britten-Norman   |
| CCW       | Countryside Council for Wales                                |
| DDV       | Drop Down Video  |
| GIS       | Geographic Information System                                |
| GPS       | Global Positioning System                                    |
| GRADISTAT | Particle Size Analysis Software (Kenneth Pye Associates Ltd) |
| ID        | Identity   |
| INNS      | Invasive Non-Native Species                                  |
| ISO       | International Organization for Standardization               |
| JNCC      | Joint Nature Conservation Committee                          |
| mBCD      | metres Below Chart Datum                                     |
| MHCBI     | Marine Habitat Classification for Britain & Ireland          |
| NMBAQC    | National Marine Biological Analytical Quality Control        |
| PMF       | Priority Marine Feature                                      |
| PSA       | Particle Size Analysis                                       |
| QA        | Quality Assessment   |
| ROV       | Remotely Operated Vehicle                                    |
| SAC       | Special Area of Conservation                                 |
| SIC       | Shetland Islands Council                                     |
| SPA       | Special Protection Area                                      |
| TOC       | Total Organic Carbon   |
| UAV       | Unmanned Aerial Vehicle                                      |
| UK        | United Kingdom   |

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

# Appendices



Innovative Thinking - Sustainable Solutions



# A Subtidal Sample Locations







Table A1. Coordinates (WGS84) of sample locations at Fair Isle and Grutness







| Sample Name | Sample Type | Location  | Latitude | Longitude |
|-------------|-------------|-----------|----------|-----------|
| G01         | Grab        | Fair Isle | 59.53937 | -1.60308  |
| G02         | Grab        | Fair Isle | 59.53936 | -1.60414  |
| G03         | Grab        | Fair Isle | 59.53844 | -1.60392  |
| G04         | Grab        | Fair Isle | 59.53876 | -1.60455  |
| DDV01       | DDV         | Fair Isle | 59.53932 | -1.60341  |
| DDV02       | DDV         | Fair Isle | 59.53946 | -1.60363  |
| DDV03       | DDV         | Fair Isle | 59.53918 | -1.60444  |
| DDV04       | DDV         | Fair Isle | 59.53898 | -1.60471  |
| DDV05       | DDV         | Fair Isle | 59.5385  | -1.60431  |
| DDV06       | DDV         | Fair Isle | 59.53861 | -1.6035   |
| G01         | Grab        | Grutness  | 59.87465 | -1.27833  |
| G02         | Grab        | Grutness  | 59.87423 | -1.27891  |
| G03         | Grab        | Grutness  | 59.87538 | -1.27894  |
| G04         | Grab        | Grutness  | 59.8746  | -1.28029  |
| DDV01       | DDV         | Grutness  | 59.87467 | -1.27748  |
| DDV02       | DDV         | Grutness  | 59.87539 | -1.27786  |
| DDV03       | DDV         | Grutness  | 59.87478 | -1.27876  |
| DDV04       | DDV         | Grutness  | 59.87449 | -1.27915  |
| DDV05       | DDV         | Grutness  | 59.87508 | -1.27992  |
| DDV06       | DDV         | Grutness  | 59.87401 | -1.27958  |

## B Subtidal Underwater Imagery

### B.1 North Haven, Fair Isle

Table B1. Underwater imagery Fair Isle


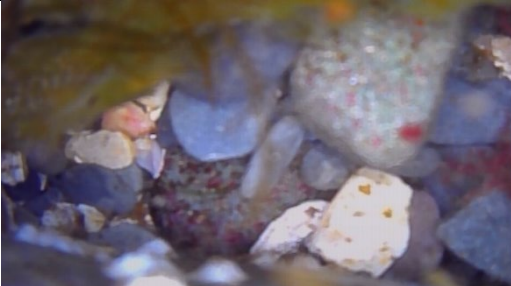




| Station | Biotope   | Site Images  |   |
|---------|---|--|---|
| FIDDV01 | <i>Laminaria hyperborea</i> forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata (IR.MIR.KR.LhypTX)                                      |    |    |
| FIDDV02 | Mixed <i>Laminaria hyperborea</i> and <i>Saccharina latissima</i> on sheltered infralittoral rock (IR.LIR.K.LhypSlat)/<br><br>Infralittoral muddy sand (SS.SSa.IMuSa) |   |   |
| FIDDV03 | <i>Laminaria hyperborea</i> forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata (IR.MIR.KR.LhypTX)                                      |  |  |


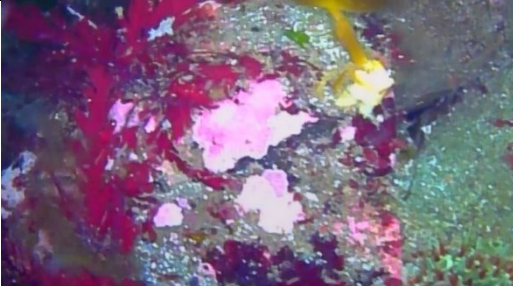



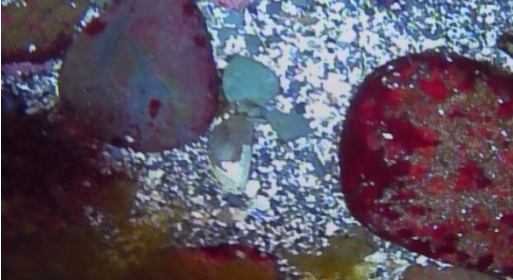
| Station | Biotope  | Site Images   |  |
|---------|--|---|--|
| FIDDV04 | <i>Arenicola marina</i> in infralittoral fine sand or muddy sand (SS.SSa.IMuSa.AreISa) |   |   |
| FIDDV05 | <i>Arenicola marina</i> in infralittoral fine sand or muddy sand (SS.SSa.IMuSa.AreISa) |   |   |
| FIDDV06 | <i>Arenicola marina</i> in infralittoral fine sand or muddy sand (SS.SSa.IMuSa.AreISa) |  |  |



## B.2 Grutness, Shetland Isles

Table B2. Underwater imagery Grutness

| Station | Biotope  | Site Images   |  |
|---------|--|---|--|
| GDDV01  | Mixed kelps with scour-tolerant and opportunistic foliose red seaweeds on scoured or sand-covered infralittoral rock (IR.HIR.KSed.XKScrR)  |   |   |
| GDDV02  | <i>Alaria esculenta</i> on exposed sublittoral fringe bedrock (IR.HIR.KFaR.AI) / Mixed kelps with scour-tolerant and opportunistic foliose red seaweeds on scoured or sand-covered infralittoral rock (IR.HIR.KSed.XKScrR) |   |   |
| GDDV03  | Mixed <i>Laminaria hyperborea</i> and <i>Saccharina latissima</i> forest on sheltered upper infralittoral rock (IR.LIR.K.LhypSlat.Ft)  |  |  |

| Station | Biotope   | Site Images   |  |
|---------|---|---|--|
| GDDV04  | <i>Laminaria hyperborea</i> forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata (IR.MIR.KR.LhypTX.Ft) |   |   |
| GDDV05  | Infralittoral mobile clean sand with sparse fauna (SS.SSa.IFiSa.IMoSa)  |   |   |
| GDDV06  | <i>Laminaria hyperborea</i> forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata (IR.MIR.KR.LhypTX.Ft) |  |  |

## C Subtidal Species List

Table C1. Species identified from grab samples at Fair Isle and Grutness

| Taxa ID                           | Qualifiers | Phylum     | FIG03 | FIG04 | GG02 | GG04 |
|-----------------------------------|------------|------------|-------|-------|------|------|
| Animalia                          | eggs       |            |       |       |      | P    |
| Porifera                          |            | Porifera   |       |       |      | P    |
| <i>Sycon ciliatum</i>             |            | Porifera   |       |       |      | 1    |
| <i>Haliclystus salpinx</i>        |            | Cnidaria   |       |       |      | 1    |
| <i>Campanulariidae</i>            |            | Cnidaria   |       |       |      | P    |
| <i>Nemertea</i>                   |            | Nemertea   |       |       | 13   | 2    |
| <i>Nematoda</i>                   |            | Nematoda   | 73    | 170   | 349  | 367  |
| <i>Pisione remota</i>             |            | Annelida   |       |       | 2    | 1    |
| <i>Pholoe baltica</i>             |            | Annelida   | 2     |       |      |      |
| <i>Phylodoce mucosa</i>           |            | Annelida   |       |       |      | 1    |
| <i>Glycera</i>                    | juvenile   | Annelida   |       |       | 1    |      |
| <i>Eusyllis blomstrandii</i>      |            | Annelida   |       |       | 1    |      |
| <i>Streptosyllis websteri</i>     |            | Annelida   | 5     | 2     | 1    | 1    |
| <i>Syllides benedicti</i>         |            | Annelida   |       |       |      | 1    |
| <i>Nephtys cirrosa</i>            |            | Annelida   |       |       | 2    | 1    |
| <i>Nephtys longosetosa</i>        |            | Annelida   |       |       | 1    |      |
| <i>Ophryotrocha</i>               |            | Annelida   |       |       | 1    | 2    |
| <i>Protodorvillea kefersteini</i> |            | Annelida   |       |       | 8    | 1    |
| <i>Scoloplos armiger</i>          |            | Annelida   |       | 22    |      |      |
| <i>Malacoceros tetracerus</i>     |            | Annelida   |       | 5     |      |      |
| <i>Malacoceros vulgaris</i>       |            | Annelida   | 319   |       |      | 2    |
| <i>Spio filicornis</i>            |            | Annelida   | 11    |       |      |      |
| <i>Spio martinensis</i>           |            | Annelida   | 56    | 3     |      | 1    |
| <i>Spiophanes bombyx</i>          |            | Annelida   |       | 3     |      |      |
| <i>Spiophanes kroyeri</i>         |            | Annelida   |       | 1     |      |      |
| <i>Chaetozone</i>                 | juvenile   | Annelida   |       | 10    |      |      |
| <i>Chaetozone christiei</i>       |            | Annelida   | 3     | 10    | 1    |      |
| <i>Cirriformia</i>                | juvenile   | Annelida   |       |       | 23   | 12   |
| <i>Cirriformia tentaculata</i>    |            | Annelida   | 1     |       | 16   | 51   |
| <i>Baldia johnstoni</i>           |            | Annelida   |       | 1     |      |      |
| <i>Capitella</i>                  |            | Annelida   | 270   | 53    |      | 38   |
| <i>Arenicola marina</i>           |            | Annelida   |       | 2     |      |      |
| <i>Spirorbinae</i>                |            | Annelida   |       |       |      | 2    |
| <i>Tubificoides benedii</i>       |            | Annelida   | 8     | 2     | 45   | 25   |
| <i>Tubificoides pseudogaster</i>  | agg.       | Annelida   | 14    | 8     | 27   | 61   |
| <i>Grania</i>                     |            | Annelida   | 11    | 12    |      | 40   |
| <i>Copepoda</i>                   |            | Arthropoda | 4     | 1     | 2    | 63   |
| <i>Apherusa bispinosa</i>         |            | Arthropoda |       |       |      | 5    |
| <i>Periocolodes longimanus</i>    |            | Arthropoda | 21    | 26    |      |      |
| <i>Pontocrates arenarius</i>      |            | Arthropoda |       |       |      | 1    |
| <i>Harpinia laevis</i>            |            | Arthropoda |       | 2     |      |      |
| <i>Atylidae</i>                   | juvenile   | Arthropoda |       |       |      | 24   |
| <i>Nototropis falcatus</i>        |            | Arthropoda |       |       |      | 2    |
| <i>Nototropis guttatus</i>        |            | Arthropoda | 28    | 23    |      | 3    |



| Taxa ID                         | Qualifiers | Phylum        | FIG03 | FIG04 | GG02 | GG04 |
|---------------------------------|------------|---------------|-------|-------|------|------|
| <i>Dexamine spinosa</i>         |            | Arthropoda    |       |       |      | 4    |
| <i>Dexamine thea</i>            |            | Arthropoda    | 85    |       |      | 18   |
| <i>Ampelisca brevicornis</i>    |            | Arthropoda    | 13    | 5     |      |      |
| <i>Bathyporeia pelagica</i>     |            | Arthropoda    |       | 33    |      |      |
| <i>Gammaridae</i>               | indet.     | Arthropoda    | 1     |       |      | 51   |
| <i>Gammarus locusta</i>         |            | Arthropoda    |       |       |      | 4    |
| <i>Ampithoe ramondi</i>         |            | Arthropoda    | 3     |       |      |      |
| <i>Jassa falcata</i>            |            | Arthropoda    |       |       |      | 43   |
| <i>Aoridae</i>                  | female     | Arthropoda    | 1     |       |      | 2    |
| <i>Aora gracilis</i>            |            | Arthropoda    |       |       |      | 1    |
| <i>Corophiidae</i>              | indet.     | Arthropoda    |       |       | 1    |      |
| <i>Caprellidae</i>              | indet.     | Arthropoda    |       |       |      | 1    |
| <i>Munnidae</i>                 |            | Arthropoda    |       |       |      | 1    |
| <i>Idotea pelagica</i>          |            | Arthropoda    |       |       |      | 6    |
| <i>Bodotria scorpioides</i>     |            | Arthropoda    | 3     | 7     | 2    | 2    |
| <i>Monopseudocuma gilsoni</i>   |            | Arthropoda    |       |       | 1    |      |
| <i>Crangon crangon</i>          |            | Arthropoda    |       |       |      | 1    |
| <i>Patella pellucida</i>        |            | Mollusca      |       |       |      | 1    |
| <i>Lacuna</i>                   | juvenile   | Mollusca      | 3     | 1     |      |      |
| <i>Rissoidae</i>                |            | Mollusca      | 1     |       |      |      |
| <i>Euspira nitida</i>           |            | Mollusca      |       |       | 1    |      |
| <i>Mytilidae</i>                | juvenile   | Mollusca      | 6     |       |      | 2    |
| <i>Lucinoma borealis</i>        | juvenile   | Mollusca      | 7     |       |      |      |
| <i>Kurtiella bidentata</i>      |            | Mollusca      | 10    |       |      |      |
| <i>Macra stultorum</i>          | juvenile   | Mollusca      |       |       | 3    |      |
| <i>Ensis</i>                    | juvenile   | Mollusca      |       | 1     | 1    |      |
| <i>Ensis ensis</i>              |            | Mollusca      |       |       | 1    |      |
| <i>Abra prismatica</i>          |            | Mollusca      |       | 3     |      |      |
| <i>Veneroidea</i>               | juvenile   | Mollusca      |       |       | 3    |      |
| <i>Chamelea striatula</i>       | juvenile   | Mollusca      |       |       | 1    |      |
| <i>Dosinia lupinus</i>          |            | Mollusca      |       |       | 1    |      |
| <i>Membranipora membranacea</i> |            | Bryozoa       |       |       |      | P    |
| <i>Electra pilosa</i>           |            | Bryozoa       |       | P     |      | P    |
| <i>Celleporella hyalina</i>     |            | Bryozoa       |       |       |      | P    |
| <i>Amphiuridae</i>              | juvenile   | Echinodermata |       | 1     |      |      |
| <i>Rhabdomolgus ruber</i>       |            | Echinodermata |       |       | 1    |      |
| <i>Ammodytidae</i>              |            | Chordata      |       |       | 1    |      |
| <i>Chironomidae</i>             | larvae     | Arthropoda    |       |       |      | 1    |

## Contact Us

ABPmer

Quayside Suite,

Medina Chambers

Town Quay, Southampton

SO14 2AQ

T +44 (0) 23 8071 1840

F +44 (0) 23 8071 1841

E [enquiries@abpmer.co.uk](mailto:enquiries@abpmer.co.uk)

[www.abpmer.co.uk](http://www.abpmer.co.uk)

