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SSF Scapa Flow Sites

Benthic ROV Survey
St Margaret's Hope

Version 1

Report to Scottish Sea Farms

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1 INTRODUCTION

An ROV survey collecting images of the seabed at four potential sites in Scapa Flow was undertaken on 19 and 20 January 2015 on behalf of Scottish Sea Farms (SSF). Three sites, Roo Point, Westerbister and Hunda North were sampled on 19 January 2015; the fourth site, St Margaret's Hope, was sampled on 20 January 2015. This report uses the collected video data to describe and characterise the benthic environment at the St Margaret's Hope site.

2 SURVEY METHODOLOGY

2.1 SURVEY EQUIPMENT AND PERSONNEL

2.1.1 Contractor details

The survey operations were conducted by a team of Orkney-based specialist contractors:

Contractor	Areas of responsibility
Aquatera	Supervise data gathering activities. Provide data interpretation and prepare survey reports.
RovingEye Enterprises (REE)	Supply and operation of the survey vessel and ROV system. Safe navigation and operation of the vessel and overall responsibility for all vessel based activities.
Triscom Enterprises (TE)	Prepare survey transects based on locations in Xodus Document Number: A-30530-S39-TECH-001 (supplied by SSF). Supply of USBL/navigation survey equipment and operators. Maintaining the integrity of the data retrieved during survey operations.

2.1.2 Personnel and equipment summary

Resource	Details
Survey vessel	*MV Lodesman*
ROV specifications	*Seaeye Falcon* ROV fitted with digital video and high resolution stills cameras to provide high quality footage for the identification of seabed flora and fauna.
Position fixing	Vessel GPS system and *EIVA Navipac* online navigation system. Easytrak USBL system for subsea ROV positioning. Vessel GPS system and EIVA Navipax online navigation system.
Survey personnel	Skipper Marine surveyor Umbilical man/deckhand ROV pilot Marine scientist/supervisor
Communications	Vessel VHF radio, mobile telephones.

2.1.3 Vessel and equipment

A Seaeye Falcon observation-class ROV fitted with a high resolution video and GoPro camera system was deployed from the survey vessel MV Lodesman. Accurate ROV position-fixing was achieved using a calibrated EasyTrak Ultra Short BaseLine (USBL) sonar system and the positional data overlaid on the video footage collected as latitude-longitude coordinates.

The vessel crew included the skipper, an umbilical man for the ROV, the ROV pilot and a marine surveyor. Aquatera supplied scientists to supervise survey activities and to observe the live footage from the ROV and, where necessary, to guide the pilot to any notable physical/ecological features.

Full vessel and ROV specifications are detailed in Appendix D.

2.2 SURVEY DESIGN

The ROV survey strategy was based on information provided in the Visual Seabed Survey Transects Technical Note prepared by Xodus for Scottish Sea Farms (Document Number: A-30530-S39-TECH-002).

The St Margaret's Hope site is proposed to host a total of 9 cages configured in single row from east to west.

Video footage was collected along two transects; the first of these ran east to west along the centre line of the longest axis of the proposed cage grid, extending to the limits of the maximum modelled Allowable Zone of Effect (AZE) boundary at either end of the cage group. The other transect ran perpendicular to the first (north to south), covering the width of the AZE from one boundary to the other. Details of the transects collected are provided in the following section.

3 SURVEY TRANSECTS

Survey transect start locations and length are detailed in Table 3.1. Full survey sequences and the associated video footage files are detailed in Appendix A.

Table 3.1 Survey transects at the St Margaret's Hope site

Transect code	Start location WGS84		Direction	Length
	Latitude	Longitude	(°grid)	(m)
SMH1	58° 50'03.7112"N	2° 59'24.0186"W	75	779.7
SMH2	58° 50'10.8013"N	2° 59'01.6748"W	165.8	213.5

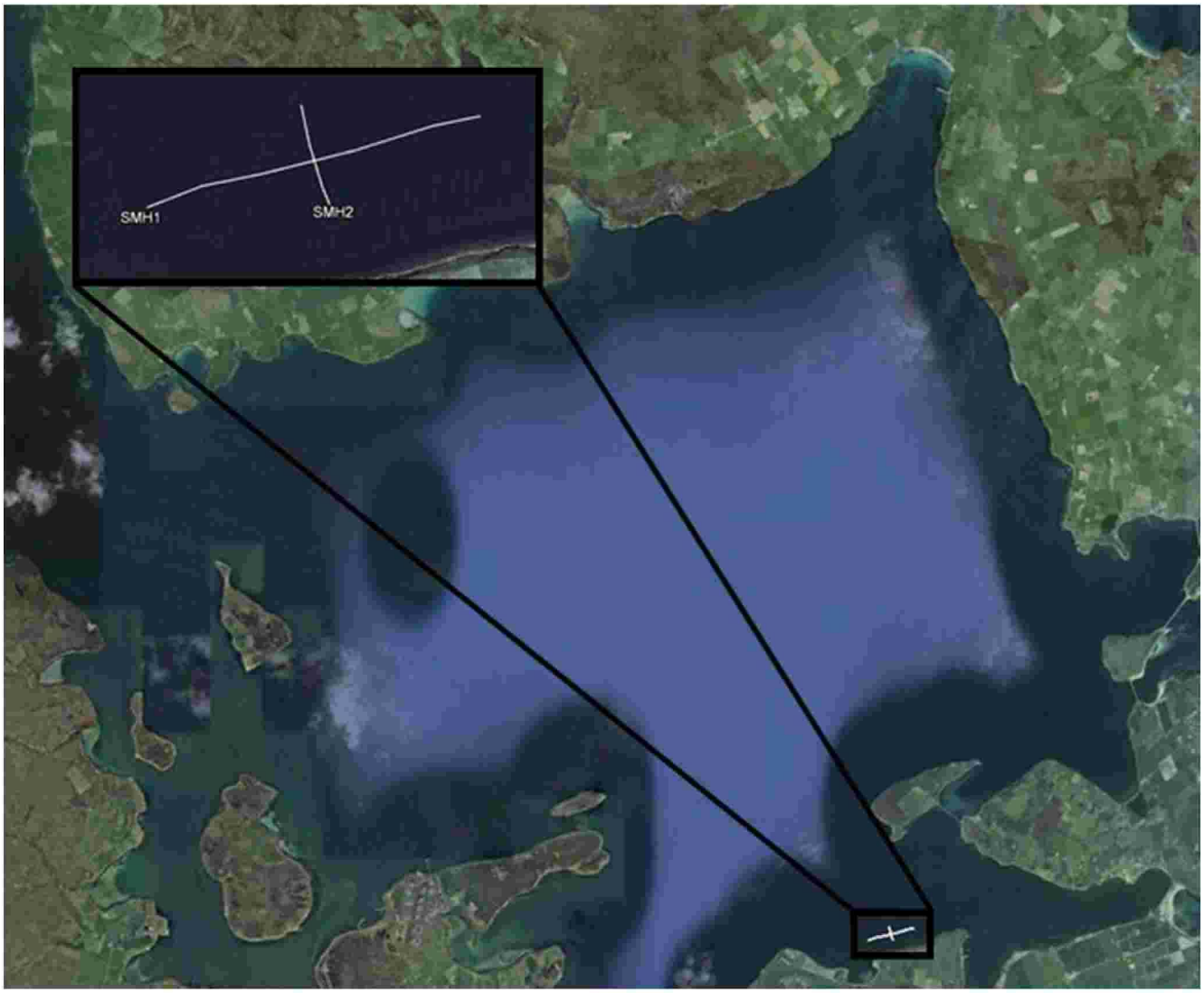


Figure 3.1 Location of survey transects at St Margaret's Hope site in Scapa Flow

4 SURVEY OBSERVATIONS

The sediment type at the St Margaret's Hope site appeared to be consistent throughout both transects, being composed of fine sandy mud with small quantities of shell debris and fine gravel in some areas. The westernmost part of SMH1 showed small ripples in the sediment; the rest of the site appeared to be mostly flat and lacking undulations. Small patches of red, loosely attached seaweed, *Phyllophora crispa*, were observed throughout the whole site. Larger patches of this seaweed were found in the northern most parts of SMH2.

Starfish *Asteria rubens* was the most common mobile epifauna observed at the site, however the majority of the fauna present appeared to be infauna. A large number of tube dwelling, filter feeding annelids (such as sand masons *Lanice conchilega*) were observed throughout both transects, as were bioturbasive mounds although these were less common. Several burrow-like holes in the sediment were observed; the presence of razor shells on the seabed suggests that this bivalve may be responsible for these features. Ocean quahog *Arctica islandica* shells were also found on the seabed; given the sediment type it is possible that that these organisms are also present in the area. However being infaunal organisms whose feeding apparatus do not protrude very far into the water column, live specimens were not identified. Several live scallops were observed on the seabed along with several empty shells which were being colonised by serpulid worms. Several large ascidians were also observed in clumps containing two or three individuals although their presence was only occasionally observed.

Seabed images captured along the St Margaret's Hope transects are presented in Figure 4.1. A detailed log of each of these locations is recorded in Appendix B Image log and larger scale images provided in Appendix C Transect images.

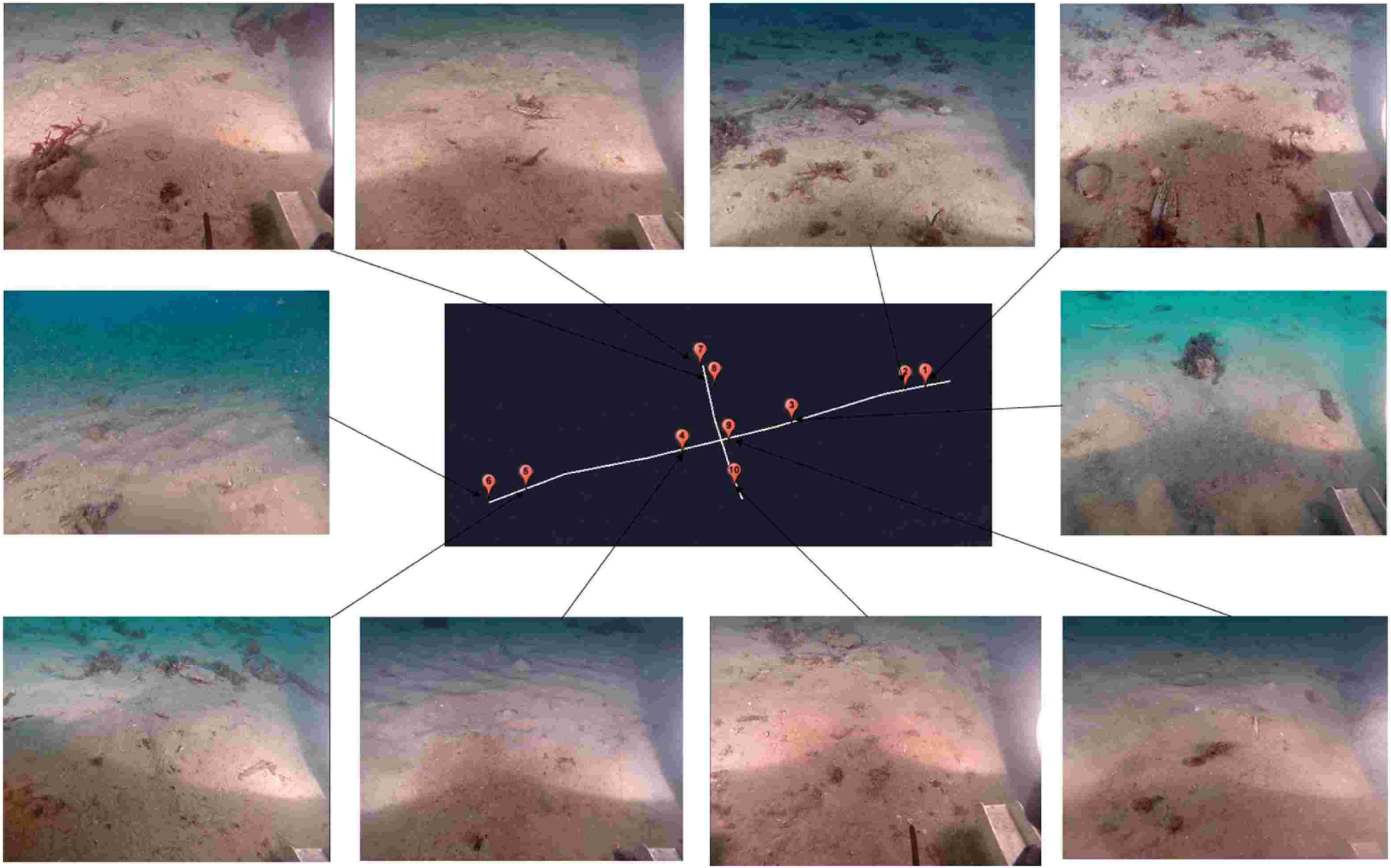


Figure 4.1 Seabed images from St Margaret's Hope site and positions on transects

5 DESCRIPTION OF BIOTOPES

The observed habitat appears to be consistent with the biotope code SS.SMp.KSwSS.Pcr, loose-lying mats of *Phyllophora crispa* on infralittoral muddy sediment. This biotope describes infralittoral muddy sand and sandy mud in depths of 5 to 30 m, most often found in very sheltered conditions, with a loose-lying cover of *Phyllophora crispa* and patches of shell debris and gravel.

These features are consistent with the physical characteristics of Scapa Flow and the evidence provided by ROV footage. The fauna identified from the video footage are also consistent with the biotope description, however there are several organisms described in the biotope description that were not identified during the survey. This does not confirm their absence as ROV video footage may not confirm the presence of some faunal groups such as infauna. Despite this there is sufficient evidence to assign the area to this biotope and is consistent with the findings of Moore *et al.* (2009) who made a similar biotope assessment of seabed habitat in a nearby location within east Scapa Flow.

SS.SMp.KSwSS.Pcr is not listed as an Annex I habitat and no live species of conservation concern were identified at the St Margaret's Hope site. The empty shells of ocean quahogs were however found at various points throughout the site. Although these shells did not occur in large numbers, their presence suggests that live ocean quahogs may inhabit the area. This species is known to occur elsewhere in Scapa Flow[1] and is listed as an Annex II species and a UK Priority Marine Feature (PMF) species.

[1] *Arctica islandica* has been recorded in various locations in Scapa Flow according to the NBN gateway of biological records at: https://data.nbn.org.uk/

6 REFERENCES

Moore, C.G. (2009). *Preliminary assessment of the conservation importance of benthic epifaunal species and habitats of the Pentland Firth and Orkney islands in relation to the development of renewable energy schemes.* Scottish Natural Heritage Commissioned Report No. 319.

APPENDIX A TRANSECT LOCATIONS AND VIDEO LOG

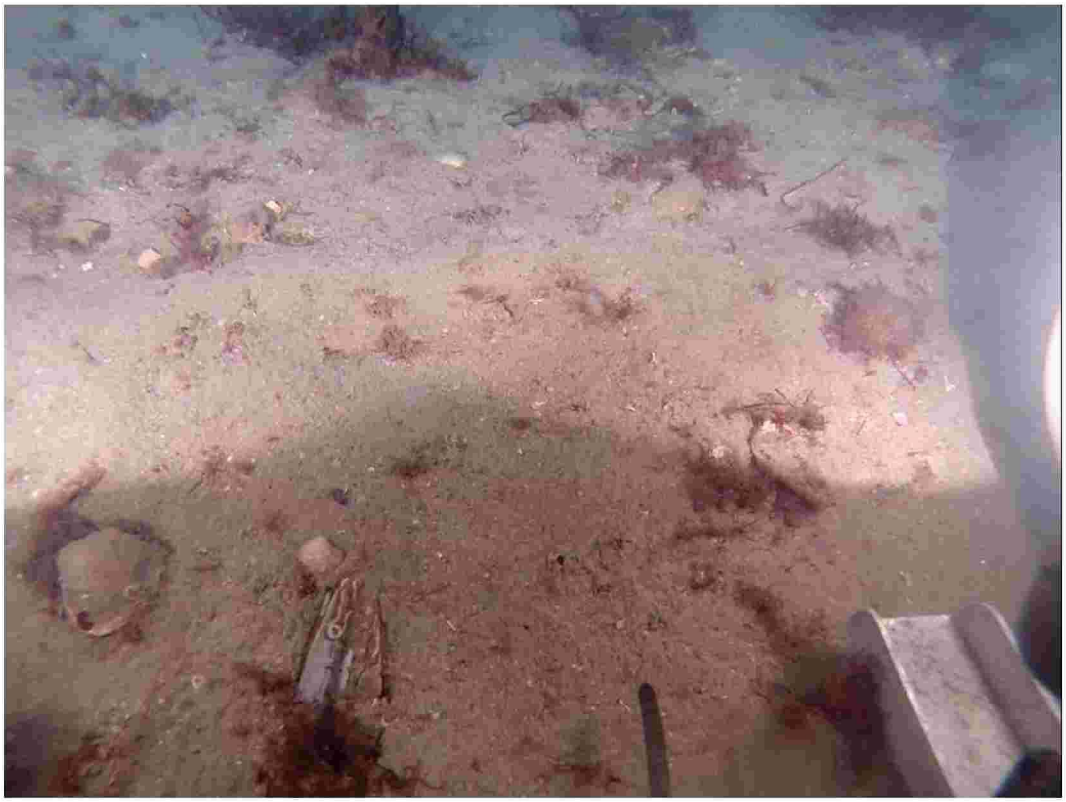
Transect	File	Start		End		Start ID	End ID	GoPro files
		N	W	N	W			
SMH1	VTS_01_1	58 50.1759	2 58.6090	58 50.0631	2 59.3993	A	B	GOPR0213, GP010213
SMH2	VTS_02_1	58 50.1856	2 59.0420	58 50.0671	2 58.9643	C	D	GOPR0215

St Margaret's Hope transect locations

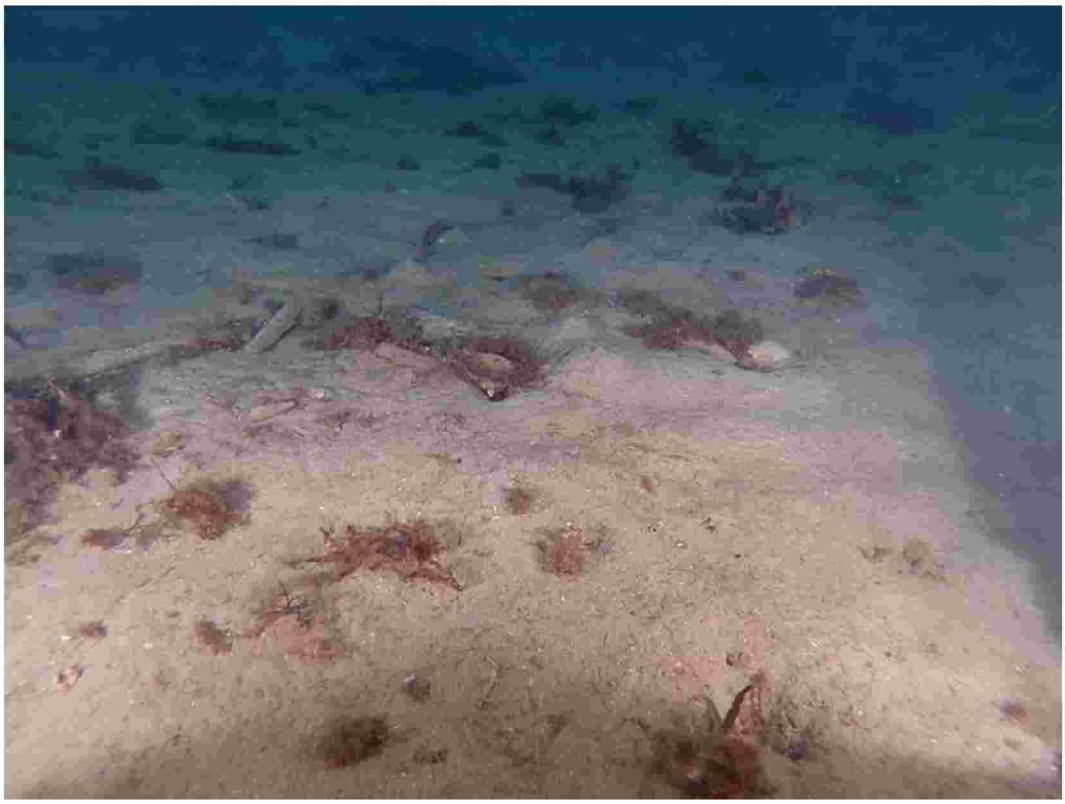
APPENDIX B IMAGE LOG

Image ID	Latitude	Longitude	Depth (m)	Descriptive notes	Biotope type
SMH1	58° 50.168504'N	2° 58.652902'W	17.6	Sandy mud with patches of *Phyllophora crispa,* empty razor and ocean quahog shell with serpulid worms.	SS.SMp.KSwSS.Pcr
SMH2	58° 50.167108'N	2° 58.68795'W	18.4	Sandy mud with patches of *Phyllophora crispa* and shell debris.	SS.SMp.KSwSS.Pcr
SMH3	58° 50.135304'N	2° 58.88414'W	19.9	Sandy mud with patches of *Phyllophora crispa* and shell debris.	SS.SMp.KSwSS.Pcr
SMH4	58° 50.106310'N	2° 59.070846'W	20.2	Sandy mud with patches of *Phyllophora crispa,* starfish, ripples and bioturbasive mounds.	SS.SMp.KSwSS.Pcr
SMH5	58° 50.071844'N	2° 59.335672'W	16.9	Sandy mud with trails, patches of *Phyllophora crispa* and a scallop.	SS.SMp.KSwSS.Pcr
SMH6	58° 50.063327'N	2° 59.398630'W	15	Sandy mud with patches of *Phyllophora crispa* and ripples.	SS.SMp.KSwSS.Pcr
SMH7	58° 50.185654'N	2° 59.041994'W	19.4	Razor shell, holes in sediment and bioturbasive mounds	SS.SMp.KSwSS.Pcr
SMH8	58° 50.168247'N	2° 59.016850'W	19.3	Sandy mud with patches of *Phyllophora crispa* and large ascidians.	SS.SMp.KSwSS.Pcr
SMH9	58° 50.115556'N	2° 58.991565'W	20.1	Sandy mud with sparse *Phyllophora crispa* and bioturbasive mounds.	SS.SMp.KSwSS.Pcr
SMH10	58° 50.075931'N	2° 58.981730'W	20	Sandy mud with patches of *Phyllophora crispa* and shell debris.	SS.SMp.KSwSS.Pcr

APPENDIX C TRANSECT IMAGES

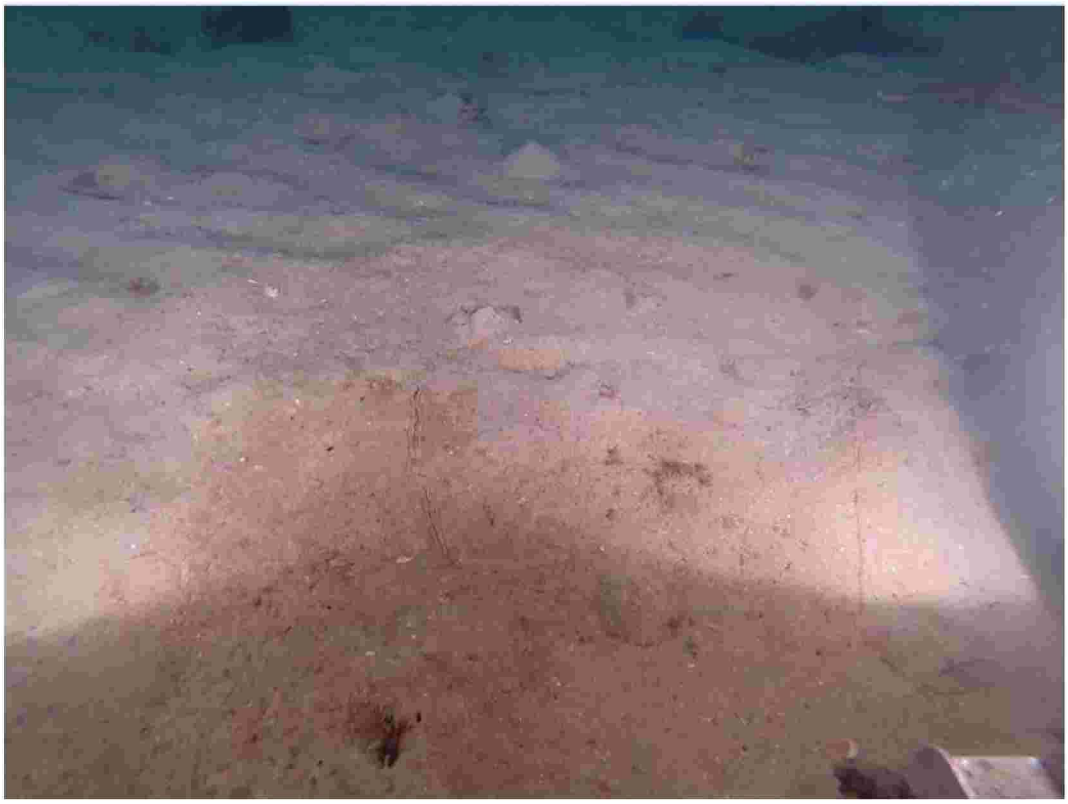


SMH1



SMH2

SMH3



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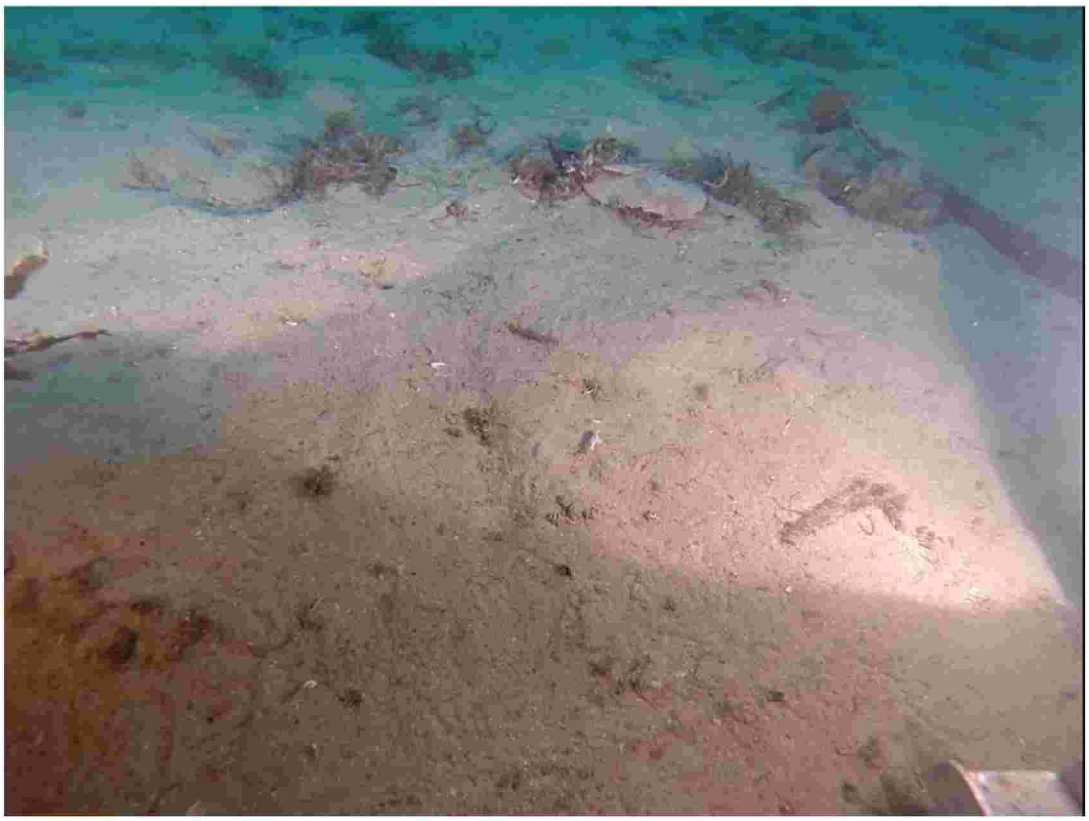

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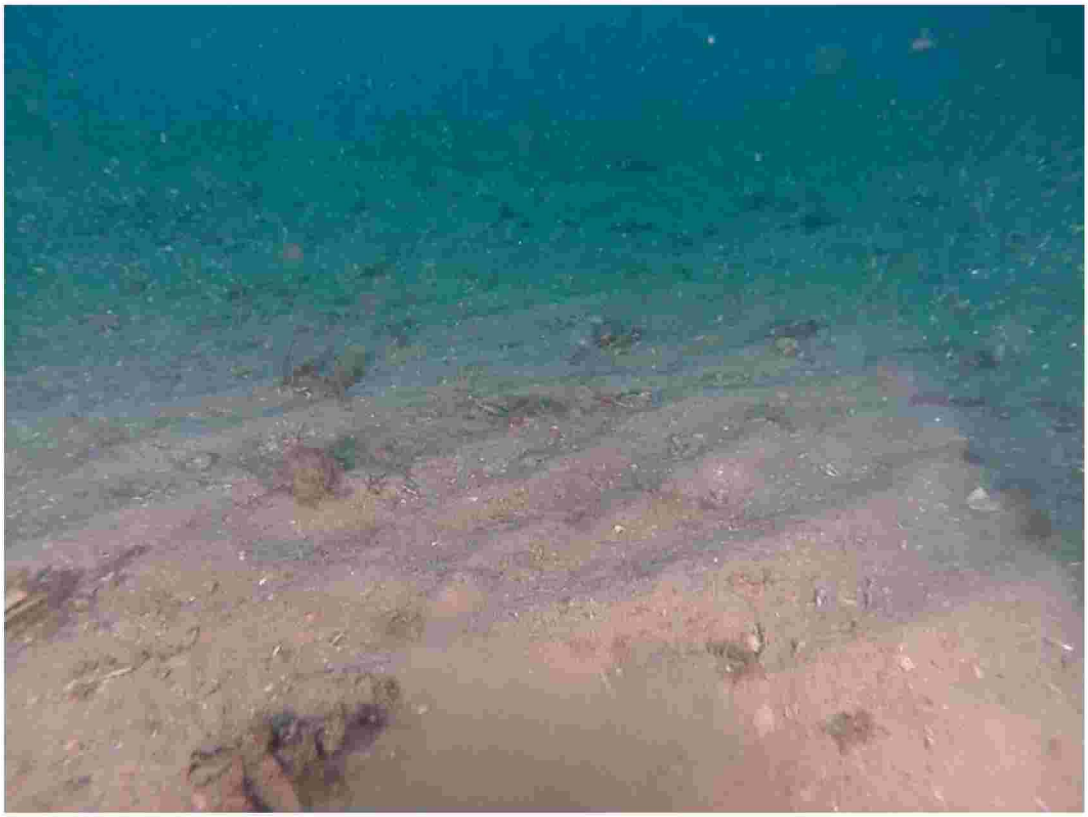
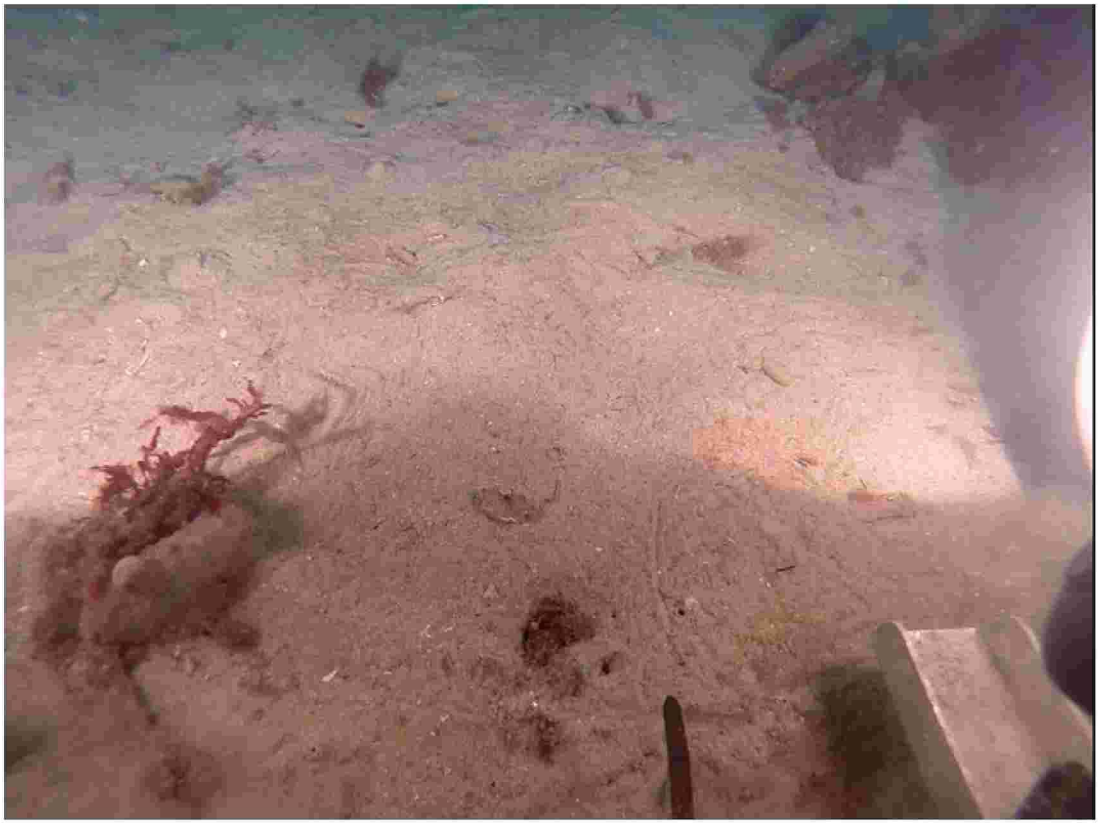


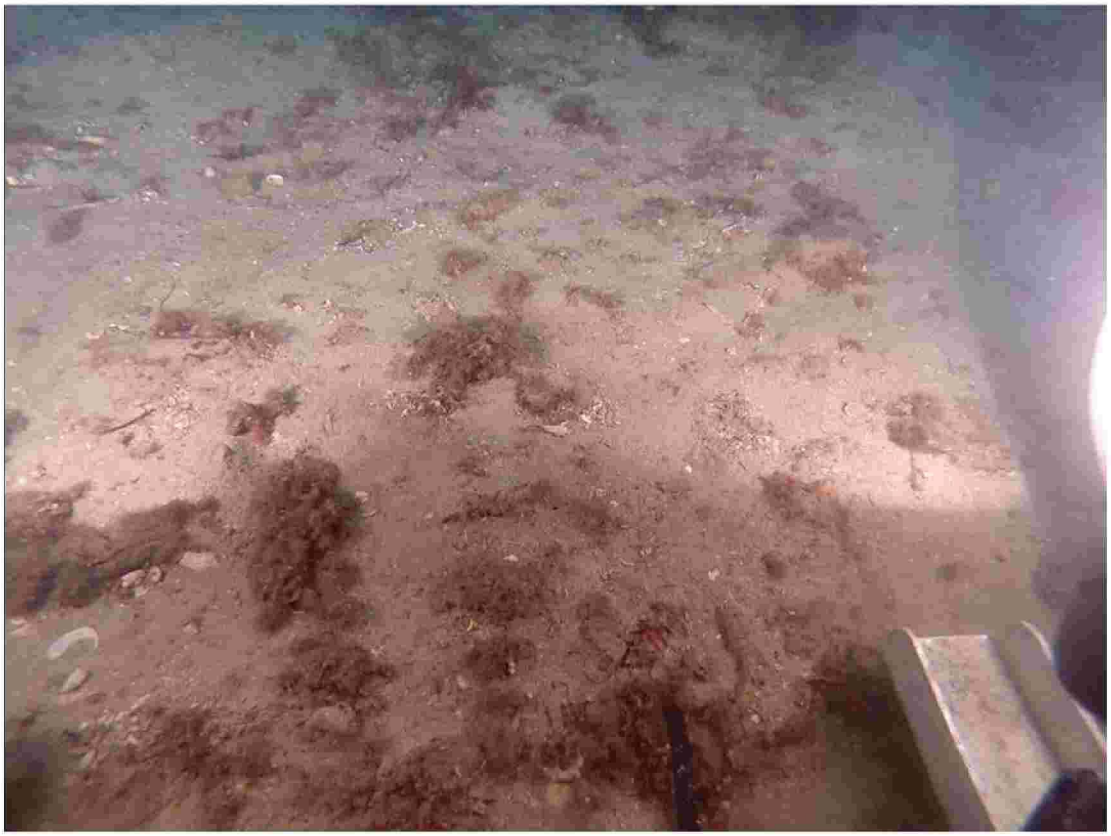
SMH6

SMH7



SMH8

SMH9



SMH10

APPENDIX D VESSEL AND EQUIPMENT SPECIFICATIONS

D.1 VESSEL SPECIFICATIONS

Name

MV Lodesman

Design

Originally built for the Trinity House pilotage service in 1967, by R.S. Stokvis & Zonen N.V. Rotterdam. Overall hull dimensions are 21.67 x 5.48 x2.6 draft aft. The hull design is based on the Clyde class of RNLI lifeboats and features a double skin and built in buoyancy. Overall design was by Burness Corlett & Partners to Lloyds specifications. The hull is steel and superstructure G.R.P.

Propulsion

2 x Gardener 8LB's, 2:1 reduction with single lever controls. Tenjford hydraulic, spade rudders behind each propeller, dual hydraulic system working from each engine as required with jockey lever control through autopilot (Robertson AP40) also upper steering position with main controls duplicated.

Layout and Equipment

From forward, fore peak with chain locker, single phase 230 v a.c. motor driving anchor windlass, W/T bulkhead, forward cabin access from deck behind spray shelter, used as a storage area for ROV equipment. Seat lockers and access through bolt down hatches to sonar and tank space below. W/T bulkhead with W/T door to engine room. Tankage for fuel, centre line 3,300 litres, twin wing tanks aft about 3,000 litres each, 2000 litre reserve tank, plus 3,500 litres approximately, below fore cabin floor. Access ladder leads into forward end of wheelhouse. This is fitted with main steering position, separate chart table and ROV Station. Comprehensive electronics as well as full display of engine temperatures etc., and bilge and fire alarms. Control switches for all equipment arranged for either/or duplicate operation from either port or starboard batteries.

D.2 ROV SYSTEM SPECIFICATIONS

STANDARD FALCON FEATURES INCLUDE:

- 300 m (1,000 ft) depth rating, 8.5 kg (19 lbs) payload
- Max 450 m umbilical length upgradeable to 1100 m length with F2 Fibre Optic Pack upgrade
- Magnetically coupled brushless DC thrusters with velocity feedback - 4 vectored and 1 vertical
- 50 kgf (110 lbs) of thrust with 1:1 power to weight ratio, without additional payload
- Distributed intelligence control system
- High resolution colour camera on 180° tilt platform
- Variable intensity 150 Watts of lighting
- Auto heading and depth
- Single phase 100-270 VAC universal auto sensing power input at 2.8 kW.

SPECIFICATIONS	FALCON
System power requirements	Single phase 100-270 VAC at 2.8kW
Maximum umbilical length	450 m
Depth rating	300 msw
Length	1000 mm
Height	500 mm
Width	600 mm
Launch weight	55 kg
Forward speed	> 3 knots
Thrust forward	50 kgf
Thrust lateral	28 kgf
Thrust vertical	13 kgf
Payload	8.5 kg