



**Argyll and Summer Isles Sites**

**Benthic ROV Survey**

**Shuna**

**Version 2**

**Report to Scottish Sea Farms**

**Issued by Aquatera Ltd**

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## Contents

<b>CONTENTS.....</b>	<b>III</b>
<b>LIST OF FIGURES .....</b>	<b>IV</b>
<b>LIST OF TABLES .....</b>	<b>IV</b>
<b>1 INTRODUCTION.....</b>	<b>1</b>
<b>2 SURVEY METHODOLOGY .....</b>	<b>2</b>
<b>2.1 SURVEY OPERATIONS.....</b>	<b>2</b>
2.1.1 ROV survey.....	2
2.1.2 Towed camera survey.....	2
<b>2.2 SURVEY DESIGN.....</b>	<b>2</b>
<b>3 SURVEY OBSERVATIONS .....</b>	<b>5</b>
<b>4 DESCRIPTION OF BIOTOPES.....</b>	<b>12</b>
<b>5 REFERENCES.....</b>	<b>13</b>

**List of Figures**

Figure 1.1 Shuna site layout  
 .....**Error! Bookmark not defined.**

Figure 2.1 Location of planned survey transects at  
 Shuna ..... 3

Figure 2.2 Survey transects including the December  
 2020 T1A and T1B extension ..... 4

Figure 3.1 Seabed images collected across the Shuna  
 site, April 2018 and December 2020 ..... 6

Figure 3.2 Seabed Images, Transect A, Shuna, April  
 2018 ..... 7

Figure 3.3 Seabed Images, Transect B, Shuna, April  
 2018 ..... 8

Figure 3.4 Seabed Images, Transect C, Shuna, April  
 2018 ..... 9

Figure 3.5 Seabed Images, Transect T1A and T1B,  
 Shuna, December 2020 .....11

Figure 3.6 High resolution images showing dominant  
 habitats and species recorded at Shuna, April 2018 and  
 December 2020.....13

**List of Tables**

Table 1.1 Proposed site details  
 ..... 1

Table 2.1 Equipment and personnel summary  
 ..... 2

Table 2.2 Survey transects at the Shuna site  
 ..... 3







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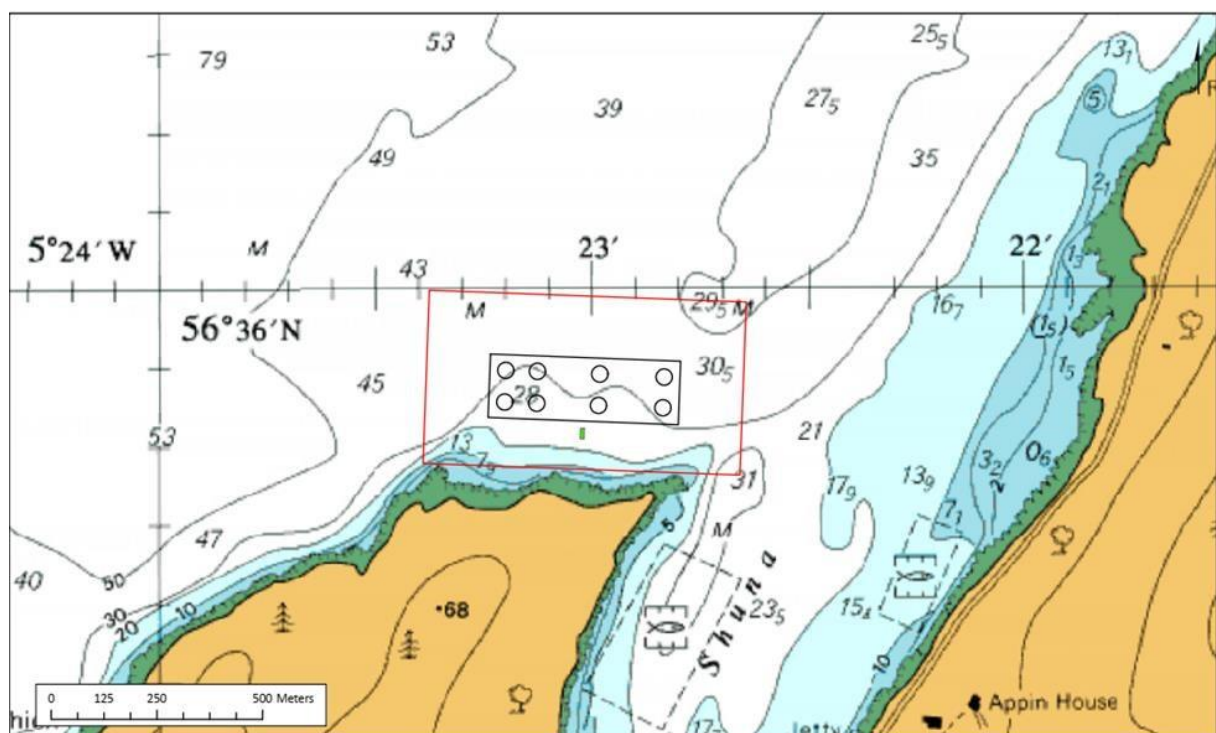
# 1 INTRODUCTION

A remotely operated vehicle (ROV) survey collecting seabed images at a new potential fish farm site, located off the west coast of Scotland, was undertaken on 16 April 2018 on behalf of Scottish Sea Farms (SSF). This report uses the video data collected at the Shuna site (Figure 1.1) to describe and characterise the baseline benthic environment in the area and identify potentially sensitive habitats or species. The site details are presented in Table 1.1.

A subsequent re-run of benthic impact modelling using NewDEPOMOD predicted a different depositional output to the output generated by preliminary AutoDEPOMOD modelling (Section 2.2). On 15 December 2020 an additional towed camera survey was performed on behalf of SSF and located east of the Shuna fish farm site, to further investigate benthic habitats within the predicted depositional footprint. Results of the additional surveyed transect are presented in Sections 3 and 4.

**Table 1.1 Proposed site details**

Site details	Description
Site name	Shuna
Location (group centre)	192380 E, 750260 N
Site address	Shuna, Argyll
Maximum proposed biomass	1870 tonnes
Proposed no. of pens and size	8 x 120 m circumference



**Figure 1.1 Shuna site layout**

## 2 SURVEY METHODOLOGY

### 2.1 SURVEY OPERATIONS

#### 2.1.1 ROV survey

Survey operations were conducted by a team of specialist contractors RovingEye Enterprises Ltd on behalf of Scottish Sea Farms on 16 April 2018. Details of the equipment and personnel deployed are summarised in Table 2.1.

**Table 2.1** Equipment and personnel summary

Resource	Details
Survey vessel	<i>MV Advance</i>
ROV specifications	<i>Seaeye Falcon</i> 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 <i>EIVA Navipac</i> online navigation system. Easytrak USBL system for subsea ROV positioning. Vessel GPS system and EIVA Navipax online navigation system.
Survey personnel	Skipper SSF Rep Umbilical man/deckhand ROV pilot
Communications	Vessel VHF radio, mobile telephones.

#### 2.1.2 Towed camera survey

Specialist contractors Anderson Marine Survey Ltd (AMSL) conducted a towed camera survey on behalf of SSF on 15 December 2020, using AMSL's 6.7 m vessel *Mollie B*. Positioning and depth data were provided by a Simrad NSS7 evo.2 chart plotter with fixes at 1s intervals logged directly to PC.

The video survey of defined transects was carried out using a camera frame fitted with a Bowtech DIVECAM-550C-ALI4 camera, GoPro video camera and two high intensity LED lights. The system was also equipped with two parallel laser pointers at 20 cm separation. The camera frame was towed along a pre-determined transect line at approximately 0.5 knots just above the seabed, and allowed to settle briefly on the seabed at frequent intervals.

### 2.2 SURVEY DESIGN

The ROV survey design was established by SSF with agreement from NatureScot and Scottish Environment Protection Agency (SEPA) prior to mobilisation. The survey was focussed on the collection of footage along three transects (A-C), with two parallel transects (B and C) centred across four of the proposed 12 pens, and the third centred in the middle of the site with six pens on each side (A). These transects extend beyond the limits of the maximum modelled Allowable Zone of Effect (AZE) boundary of waste deposition for the cage group (as determined by preliminary modelling using AutoDEPOMOD, Figure 2.1).

The ROV was directed over the seabed at a suitable height to provide a general overview of the seabed characteristics. The transit of the ROV was paused to obtain still images of notable seabed features, habitats or species encountered along the survey transects.

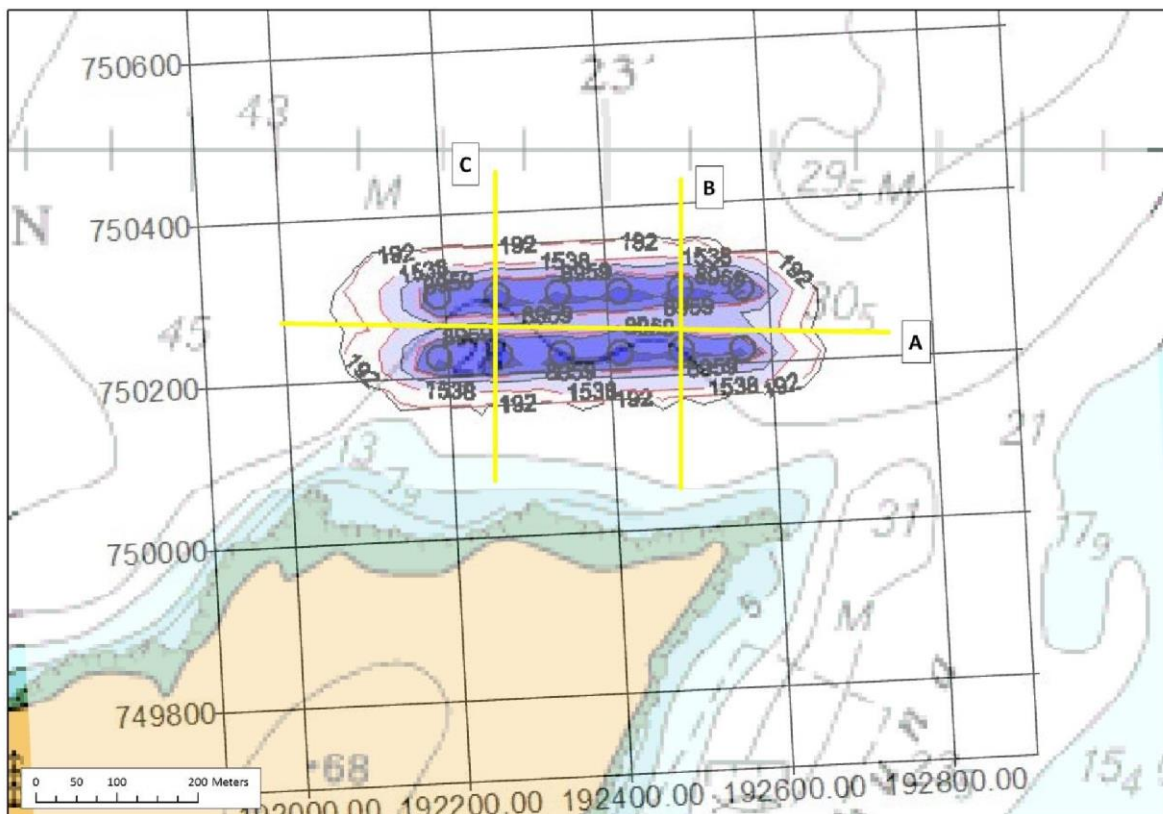


To allow representative coverage of benthic habitats within the revised area of deposition as predicted by modelling using NewDEPOMOD, the AMSL towed camera survey focussed on the collection of footage along an additional transect, positioned from east to west and situated east, adjacent to transect A. During the survey, recording was briefly interrupted due to the presence of a creel line, therefore the transect was divided into T1A and T1B to ensure safe manoeuvring of the camera equipment.

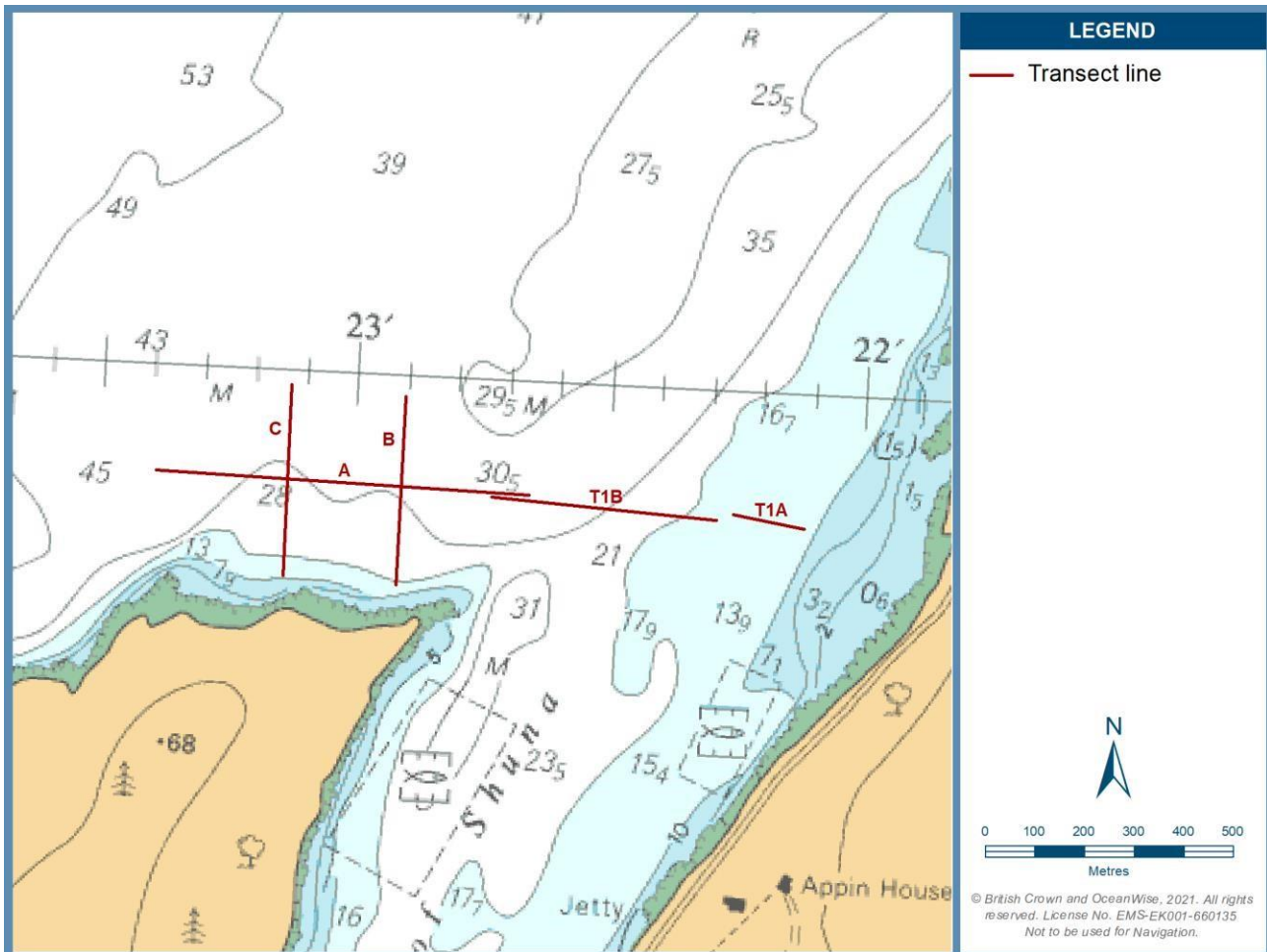
Planned survey transect start and end locations are listed in Table 2.2 and shown in Figure 2.1 and Figure 2.2.

**Table 2.2 Survey transects at the Shuna site**

Transect code	location WGS84			
	Start		End	
	Latitude	Longitude	Latitude	Longitude
A	56 35.886 N	05 23.393 W	56 35.879 N	05 22.659 W
B	56 35.775 N	05 22.911 W	56 35.979 N	05 22.910 W
C	56 35.986 N	05 23.135 W	56 35.779 N	05 23.134 W
T1A	56 35.857 N	05 22.115 W	56 35.869 N	05 22.255 W
T1B	56 35.862 N	05 22.288 W	56 35.875 N	05 22.731 W



**Figure 2.1 Location of planned survey transects at Shuna**



**Figure 2.2 Survey transects including the December 2020 T1A and T1B extension**

Slight variations in seabed characteristics were observed throughout the Shuna site during the April 2018 survey. Water depths ranged from approximately 9 m in the southern part of the survey area off the coast to 47 m in the northwest. Sediments in shallow areas less than 20 m were heterogeneous and consisted of variable proportions of fine sands, gravel, and shell fragments with scattered pebbles, cobbles and occasional boulders. At depths greater than 20 m, the composition of sediments transitioned to fine sands and muds with common patches of coarse material including pebbles and cobbles, as well as aggregations of shells (possibly *Turritella spp.*; most frequently observed along transect C). Soft muds dominated at depths greater than 30 m throughout the north and west of the survey area.

Red and brown macroalgae were patchily observed at 9 m depth and occurred less frequently at greater depths beyond 20 m where only sparse kelp debris was recorded. Sea urchins (*Echinus esculentus*) were recorded in association with macroalgae in low densities.



### 3 SURVEY OBSERVATIONS

Numerous *Nephrops* burrows were observed throughout the soft muds of the survey area. The squat lobster *Munida rugosa* was commonly observed on the sediment surface or inhabiting these burrows across depths of approximately 30 m and greater. The sea pens *Pennatula phosphorea* and *Funiculina quadrangularis* appeared widespread in low densities, with low numbers of other epibenthic fauna including common starfish (*Asterias rubens*) and crustaceans (possibly including the shrimp-like *Callinassa subterranea* and/or *Calocaris macandreae*). An isolated patch of Northern feather stars (*Leptometra celtica*) was recorded in association with coarse sediments at 34 m along transect A.

On single occasions along transect C, a Thornback Ray (*Raja clavata*) was observed at 45 m depth, and a Fireworks anemone (*Pachycerianthus multiplicatus*) at 25 m.

Similar seabed characteristics were observed during the December 2020 survey. Fine to medium sands with empty shells and shell fragments were observed at the beginning of transect T1A, east of the survey area at the shallowest depths of 12-13 m. Pebbles and occasional cobbles were encrusted with pink coralline algae and hydroids with scattered *E. esculentus* and *M. rugosa*. Progressing west towards the Shuna fish farm site, from around 17-20 m depth sediments transitioned to sandy muds with megafaunal burrows and low densities of sea pens *P. phosphorea* and *F. quadrangularis*. *M. rugosa* was occasionally observed at burrow entrances.

Within transect T1B areas of fine to medium sands with shell fragments, encrusted pebbles and cobbles, and scattered *Turitella spp.* were present at the beginning and near the middle of the transect. Elsewhere sandy muds with megafaunal burrows were observed with low densities of *P. phosphorea* and *F. quadrangularis*. Low numbers of epifauna present around burrowed muds included *A. rubens*, *M. rugosa*, as well as hermit crabs (*Pagurus bernhardus*) toward the end of transect T1B at the deepest parts of 30-32 m depth. Two *L. celtica* individuals were observed in the middle of transect T1B at 30.9 m depth.

Footage capture points from the ROV video taken along the Shuna transects are plotted in Figure 3.1, with corresponding seabed images presented in Figure 3.2 to Figure 3.5. Figure 3.6 shows high resolution images of the dominant sediments and species recorded at the site.



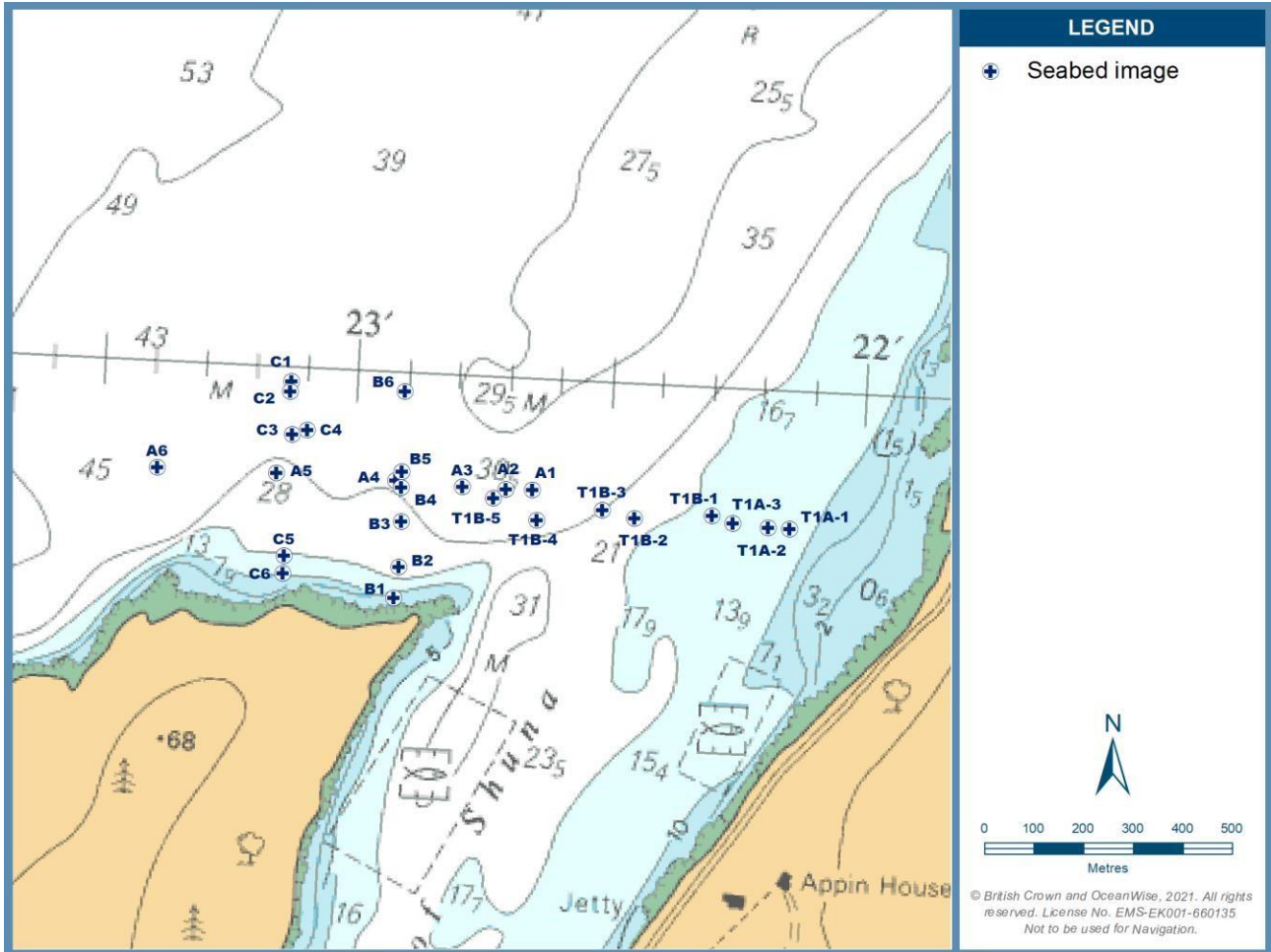


Figure 3.1 Seabed images collected across the Shuna site, April 2018 and December 2020





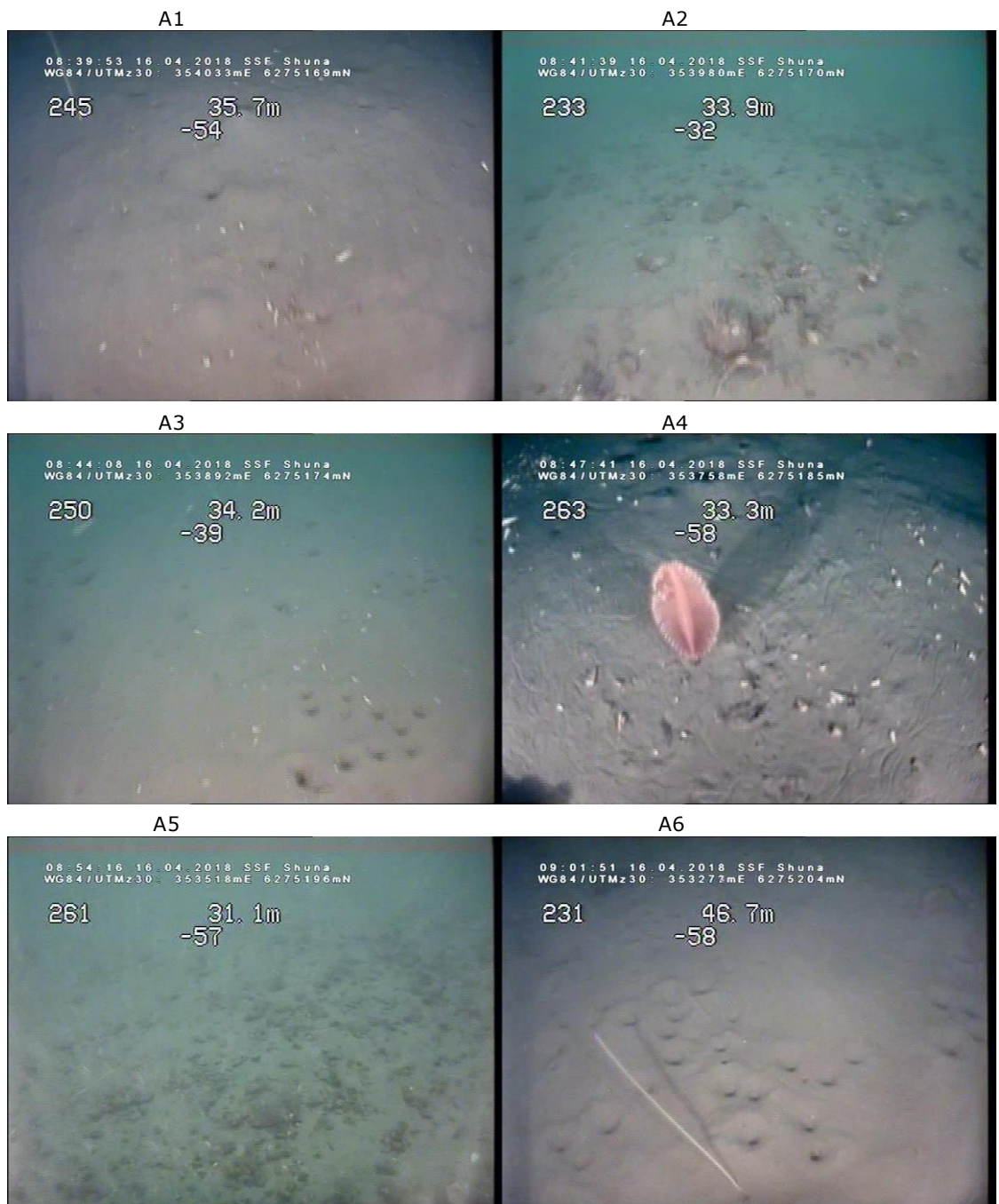


Figure 3.2 Seabed Images, Transect A, Shuna, April 2018



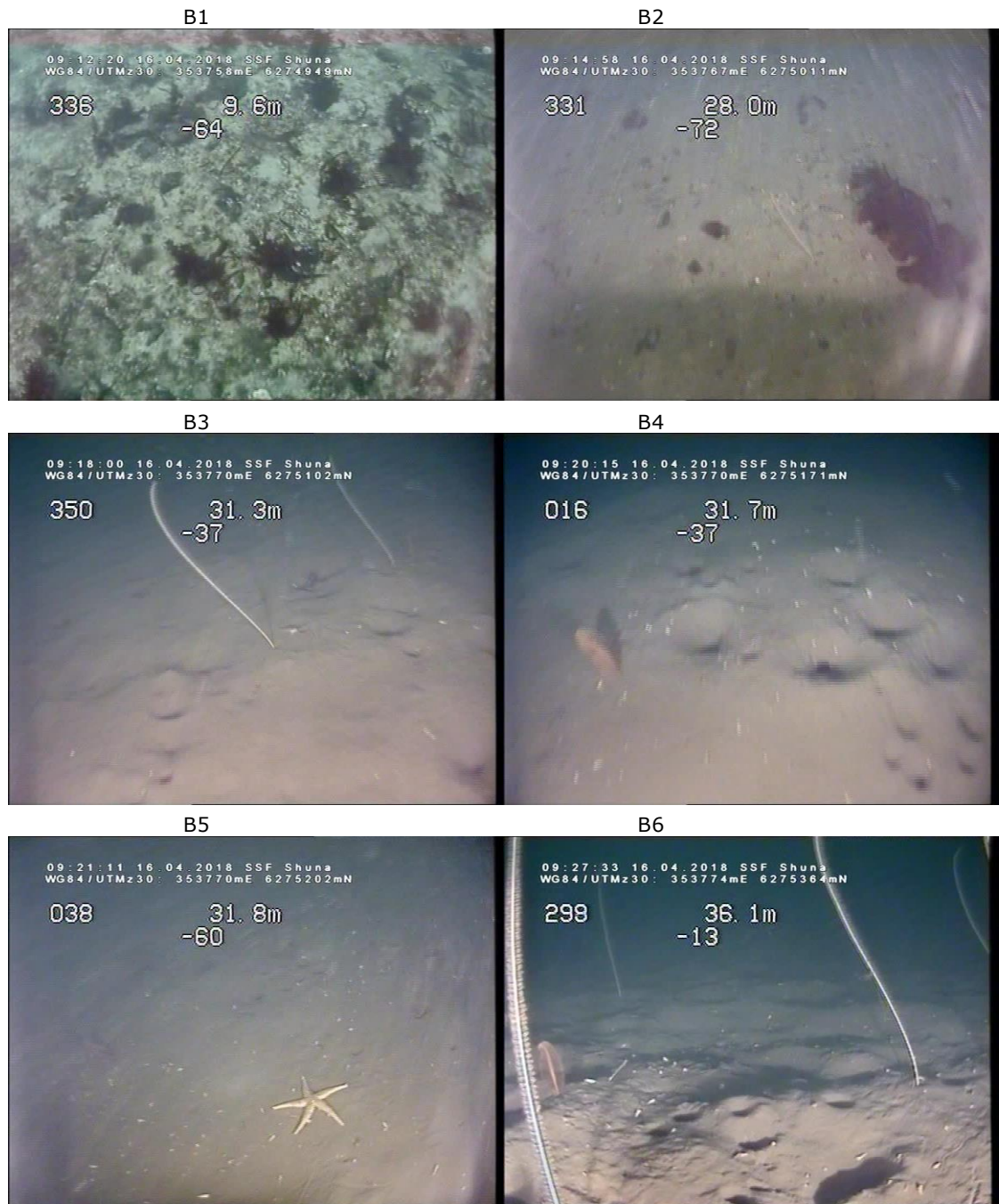


Figure 3.3 Seabed Images, Transect B, Shuna, April 2018

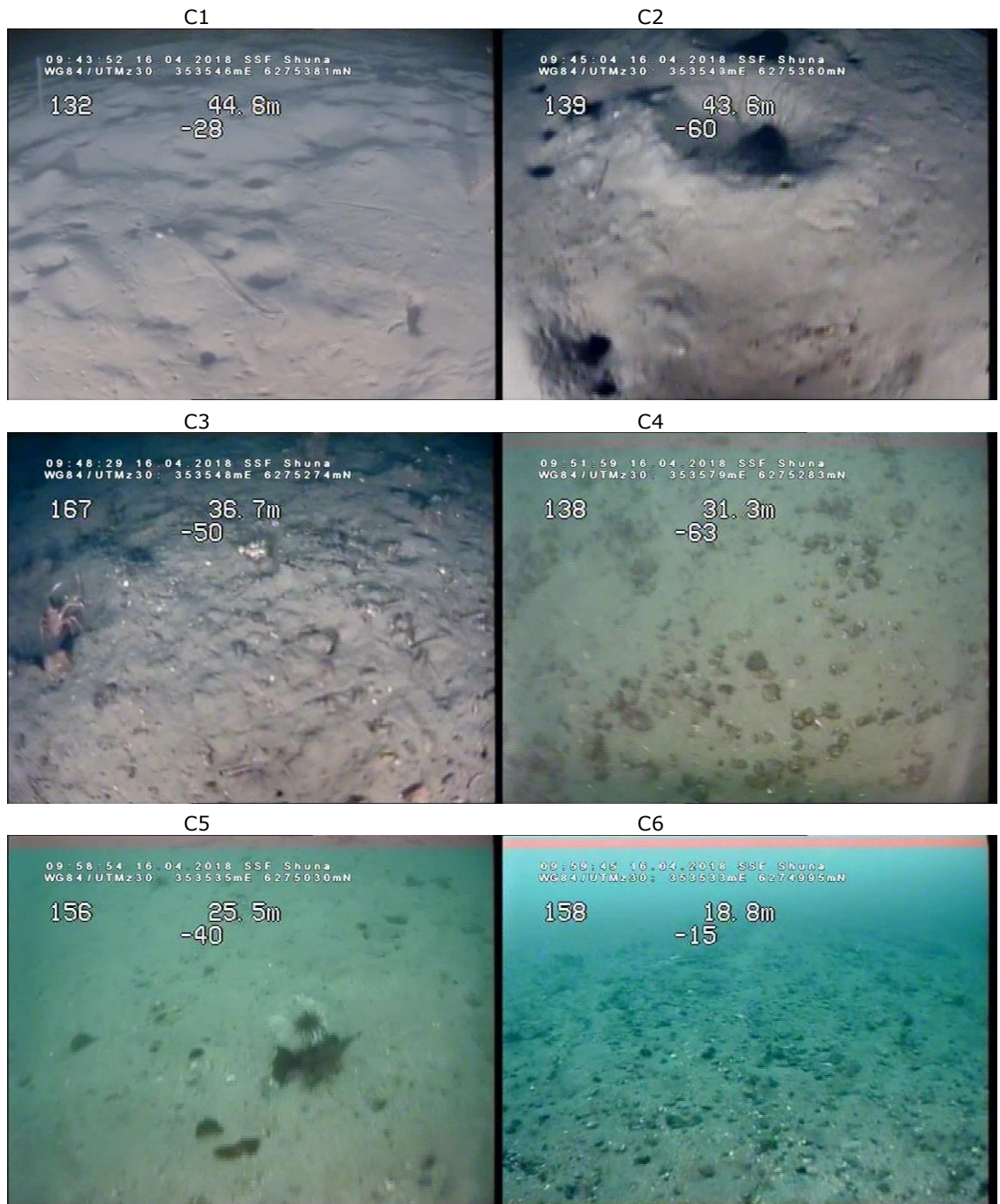
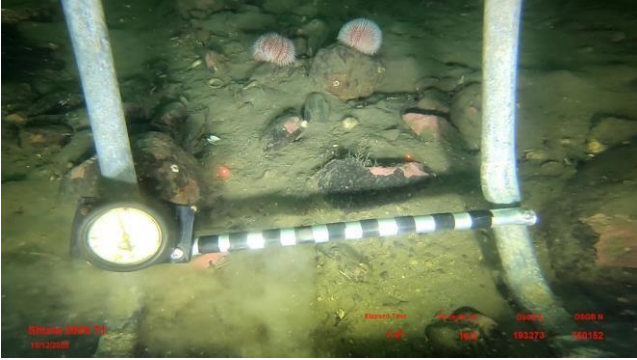


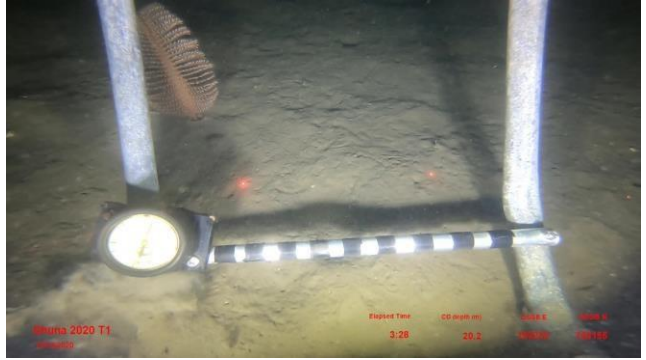
Figure 3.4 Seabed Images, Transect C, Shuna, April 2018



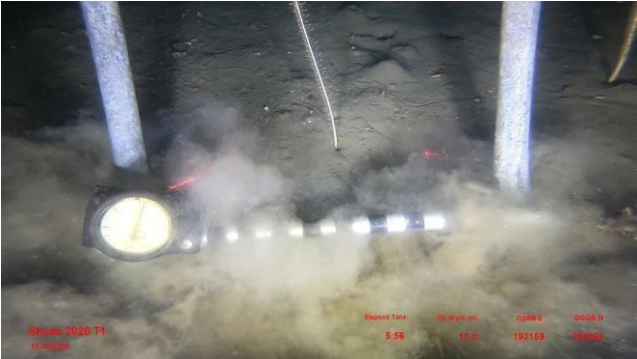
T1A-1



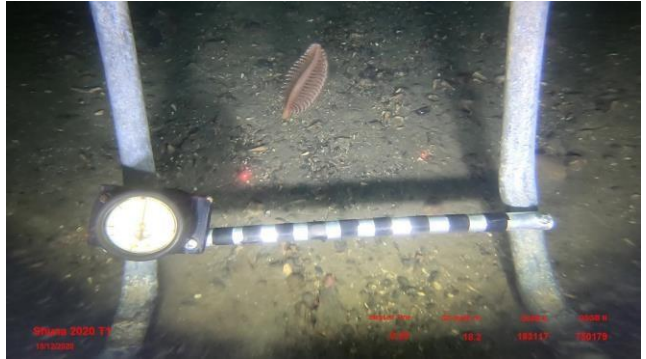
T1A-2



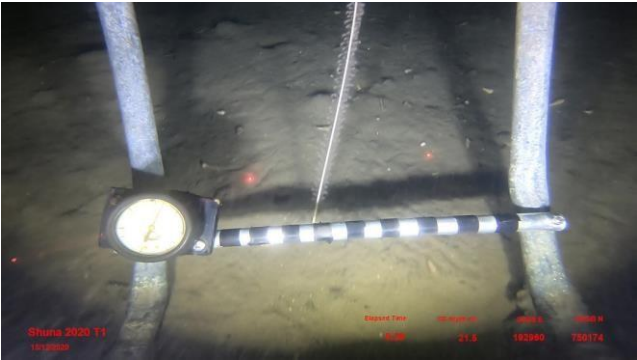
T1A-3



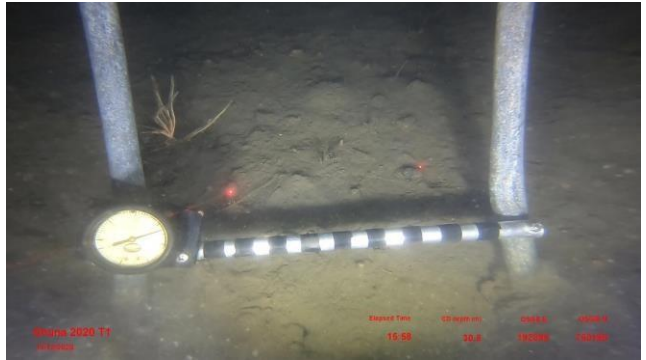
T1B-1



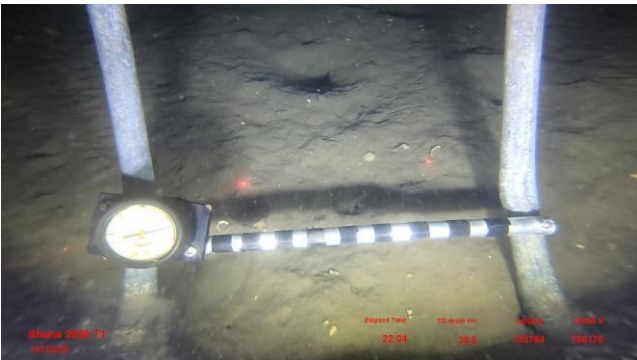
T1B-2



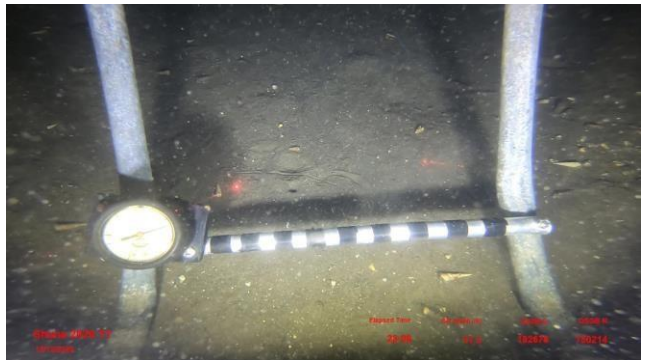
T1B-3



T1B-4



T1B-5



**Figure 3.5 Seabed Images, Transect T1A and T1B, Shuna, December 2020**



**Sediment habitats**



Mixed coarse sediments



Muddy sediments with scattered shells, cobbles, and pebbles



Soft burrowed muds

**Species**



*M. rugosa*  
Rugose squat lobster



*P. phosphorea*  
Phosphorescent sea pen



*F. quadrangularis*  
Tall sea pen



*A. rubens*  
Common starfish



*Turritella spp.*  
Sea snails



*R. clavata*  
Thornback skate



*L. celtica*  
Northern feather star

**Figure 3.6 High resolution images showing dominant habitats and species recorded at Shuna, April 2018 and December 2020**

## 4 DESCRIPTION OF BIOTOPES

The seabed sediments observed at the proposed new fish farm site at Shuna were predominantly composed of mud and fine sands. The area displayed characteristics of the following biotope types as described below:

### *Sea pen and burrowing megafauna in circalittoral fine mud (SS.SMu.CFiMu.SpMmeg)*

- Areas of the soft muddy habitat observed in deeper waters below approximately 40 m across transects A-C, and below 17-20 m across transects T1A and T1B, shared characteristics with the SS.SMu.CFiMu.SpMmeg biotope. Burrows (thought to mainly belong to *Nephrops*) were widespread below these respective depths, with sea pens *P. phosphorea* and *F. quadrangularis* present in low densities. Close representations of the SS.SMu.CFiMu.SpMmeg biotope include toward the end of transect B which shows concentrated burrows and both sea pen species situated near the burrows. Characterising species of this biotope observed in low numbers included *A. rubens*, *Turritella spp.*, and *P. bernhardus* (JNCC, 2015). This biotope is listed on the OSPAR List of Threatened and/or Declining Species and Habitats, but is not an Annex I habitat in the Habitats Directive (EU Habitats Directive 92/43/EEC). SS.SMu.CFiMu.SpMmeg is a component biotope of the 'burrowed mud' broad habitat, which is a Priority Marine Feature (PMF) in Scotland's seas (Howson et al., 2012).
- *F. quadrangularis* was present in the central and northern parts of transects A-C, and across transects T1A and T1B, however not in abundance to support classification as the sub-biotope SS.SMu.CFiMu.SpMmeg.Fun (Sea pen, including *Funiculina quadrangularis*, and burrowing megafauna in undisturbed circalittoral mud). *F. quadrangularis* is a component species of the burrowed mud PMF (Howson et al., 2012).
- One individual *P. multiplicatus* was observed near the south end of transect C. *P. multiplicatus* is associated with the SS.SMu.CFiMu.SpMmeg biotope/SS.SMu.CFiMu.SpMmeg.Fun sub-biotope (JNCC, 2015a; 2015b) and is a component species of the burrowed mud PMF (Howson et al., 2012).

### *Circalittoral mixed sediment (SS.SMx.CMx)*

- Heterogeneous fine sands with gravel, shells, pebbles and cobbles in shallow waters less than 20 m depth across transects A-C, and between 13-17 m depth across transects T1A and T1B, resembled the SS.SMx.CMx biotope complex. Sparse visible fauna in these areas included *E. esculentus*, *M. rugosa* and sparse patches of kelp debris. Due to image clarity of footage collected along transects A-C, there was difficulty in distinguishing infaunal species characteristic of specific biotopes within the complex (e.g. burrowing anemone *Cerianthus lloydii*), meanwhile no further characterising infauna, including *C. lloydii*, was observed along transects T1A and T1B.





## 5 REFERENCES

### *Northern feather star*

- There was an isolated patch of *L. celtica* on coarse sediments observed along transect A, and two further *L. celtica* individuals on sandy muds in the middle of transect T1B. *L. celtica* is not an Annex II species in the Habitats Directive but is identified as a PMF in Scotland.

The seabed features observed in this report align with a previous survey conducted in 2013 by NatureScot of the wider Firth of Lorn area including between the islands of Lismore and Kerrera (Moore, 2013). Biological analysis revealed that burrowed mud was widely distributed across the northern region of the Firth of Lorn, with *F. quadrangularis* present in high densities at many of the sites surveyed (SS.SMx.CFiMu.SpMg.Fun). Circalittoral mixed sediments (SS.SMx.CMx) were additionally observed in many sites surveyed to the west of Lismore at the eastern entrance to the Sound of Mull.

Howson, C. M., Steel, L., Carruthers, M. & Gillham, K. (2012). Identification of Priority Marine Features in Scottish territorial waters. NatureScot Commissioned Report No. 388 [online]. Available from:

<https://www.nature.scot/naturescot-commissioned-report-388-identification-priority-marine-features-scottishterritorial> (Accessed 06/01/2021).

JNCC (2015). Seapens and burrowing megafauna in circalittoral fine mud. The Marine Habitat Classification for Britain and Ireland Version 15.03 [online]. Available from: <https://mhc.jncc.gov.uk/biotopes/jnccmncr00001218> (Accessed 06/01/2021).

Moore, C.G. (2013). Biological analyses of underwater video from research cruises in Lochs Kishorn and Sunart, off the Mull of Kintyre and islands of Rum, Tiree and Islay, and in the Firth of Lorn and Sound of Mull approaches. NatureScot Commissioned Report No. 574 [online]. Available from: <https://media.nature.scot/record/~214ef01c8b> (Accessed 06/01/2021).

