



# OceanEcology

**Report No:**

## **Pinnacles & Bigbury Bay Seabed Imagery Analysis – Summary Report**

Prepared for



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## 1. INTRODUCTION

**OceanEcology** were commissioned by Devon and Severn Inshore Fisheries and Conservation Authority (D&S IFCA) to undertake the analysis of 12 hours of underwater video footage collected between June and August 2015. The purpose of this underwater video data in order to ground truth the location and extent of designated features within the Start Point to Plymouth Sound and Eddystone (SPPSE) and Plymouth Sound and Estuaries (PSE) SACs (Figure 2). The analysis involved assigning and mapping EUNIS biotopes to underwater video tows at 25 offshore stations from the Pinnacles reef area and 11 inshore sites from the Bigbury Bay to Plymouth Sound reefs. Of these 36 stations surveyed, 34 lie within the SPPSE SAC and 2 within the PSE SAC.

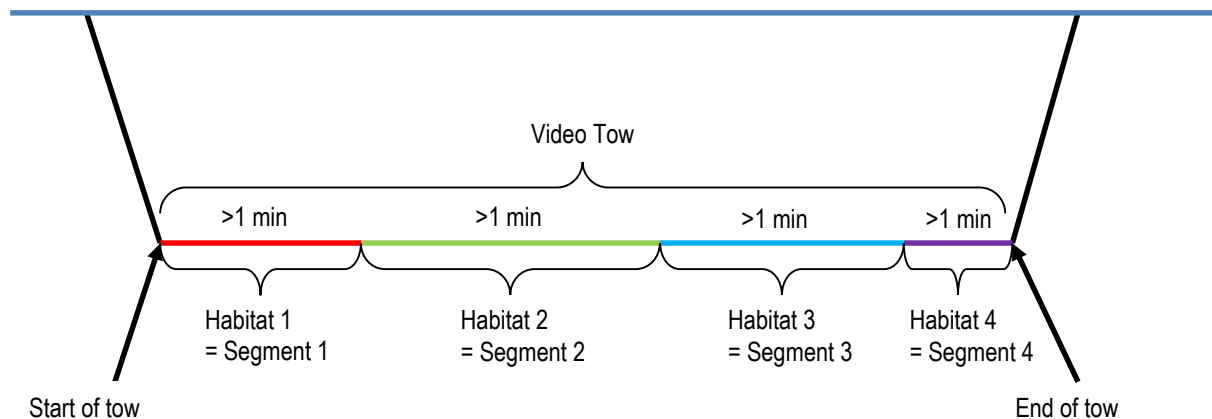
This report provides a summary of the analytical techniques employed during the analysis of the underwater video tows, the biotopes encountered and some of the notable species recorded. Raw data sheets and GIS .shp and .TAB files are provided separately.

## 2. METHODS

### 2.1 Video Tow Analysis

All seabed imagery analysis was undertaken in line with the Joint Nature Conservation Committee (JNCC) epibiota remote monitoring interpretation guidelines (Turner et al. 2015).

Using VLC media player ([http://www.videolan.org/vlc/index.en\\_GB.html](http://www.videolan.org/vlc/index.en_GB.html)) each video tow was scanned through quickly (at approximately 4 x normal speed) initially in order to identify main habitats and segment the video tow into sections representing different habitats, each representing a distinct 'Sample' (Figure 1).



**Figure 1.** Simplified illustration of method for segmenting seabed video tows based on changes in habitat. Adapted from Marine Recorder Briefing Note, JNCC.

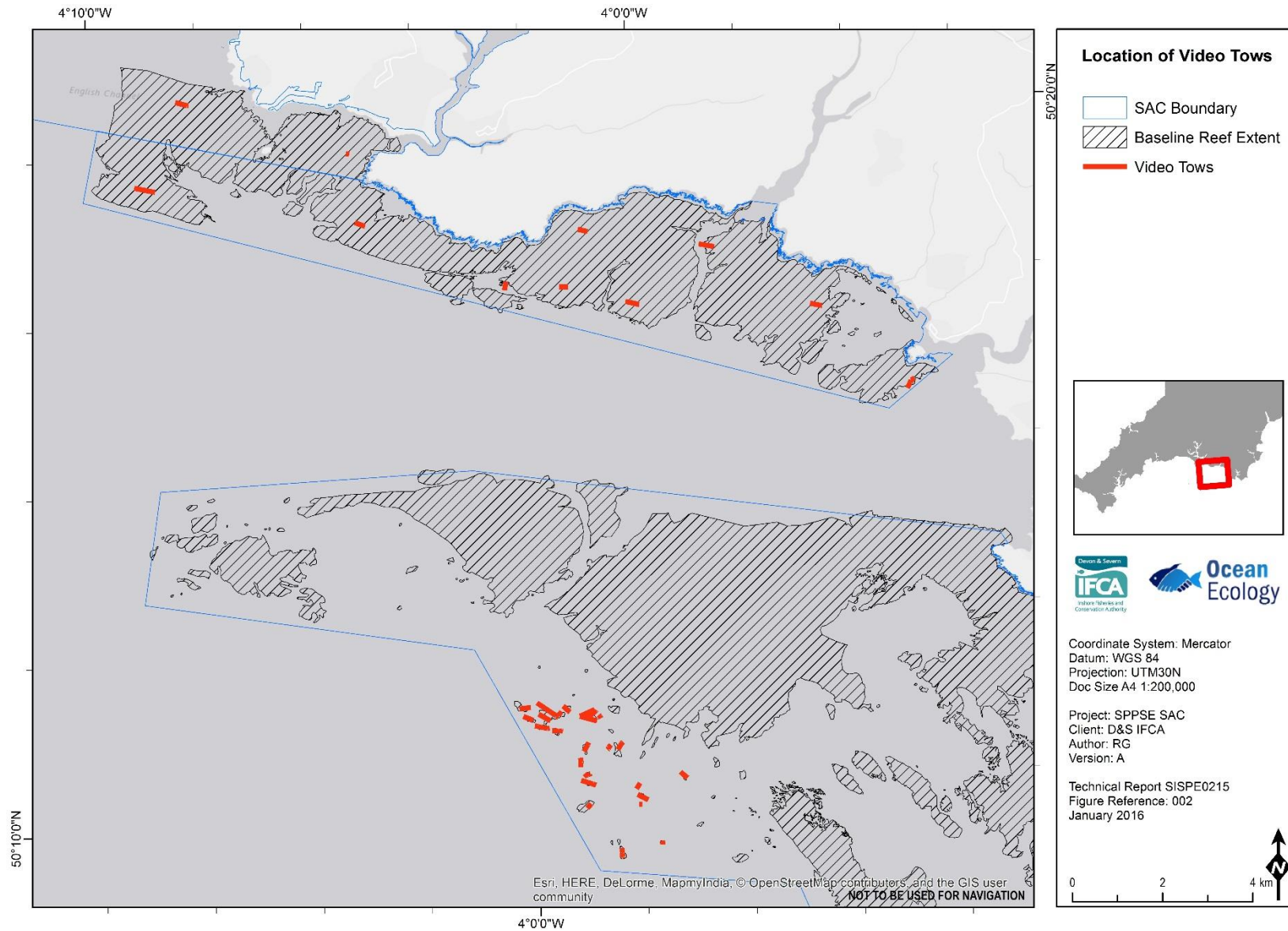


Figure 2. Map illustrating the locations of video tows sampled across the inshore and Pinnacles (offshore) reefs of the SPPSE and PSE SACs.

The tow was then viewed at normal speed and the following details were recorded in the adapted Cefas PROFORMA for each segment:

- A brief habitat description, noting physical (substrate type) and biotic characteristics
- Start and end time (from video overlay)
- Segment duration
- Start and end positions (from video overlay)
- Water depth (when available)
- Percentage substrate cover (e.g. bedrock, cobbles, shell, gravel, sand, mud, biogenic etc.)
- Broad Scale Habitat (BSH)
- Presence of any Habitat FOCI, Annex I Habitats and corresponding sub-features
- EUNIS and MNCR biotope codes and descriptors (Connor et al. 2004)
- Visual quality of video

Determination of sediment type, such as coarse, mixed, sand etc. was facilitated using the adapted Folk sediment trigon (Long, 2006) incorporated into a sediment category correlation table. Percentage gravel (defined as boulders, cobbles, shells, granules, dead/live maerl), sand and mud were used to determine and assign EUNIS broad scale habitats. Where required, EUNIS categories for each of the video and still locations were considered from the information provided on MESH (<http://www.emodnet-seabedhabitats.eu/default.aspx?page=1974>) utilising predictive habitat mapping where biotope maps were not available from existing surveys.

Therefore, for each segment, it was possible to determine the possible broad scale modelled substrate and biological zone, i.e. whether the station received enough light for algal growth (infralittoral / circalittoral) or whether the station was likely to be 'wave disturbed' (circalittoral / deep circalittoral) (McBreen et al. 2011).

Sediments were noted as cobble / stony reef when 10 % or more of the seabed substratum was composed of granules larger than pebbles ( $\geq 64$  mm, i.e. cobbles, and boulders) and the extent was identified to be  $>25$  m<sup>2</sup> from the video footage (Irving, 2009) (see Table 1). When  $>30$  % coverage was constituted by granules larger than pebbles a rock biotope and reef habitat was noted.

**Table 1.** Characteristics of Annex I 'stony reef' (from Irving, 2009).

Characteristic	Not a 'stony reef'	'Resemblance' to being a 'stony reef'		
		Low	Medium	High
<b>Composition</b> (proportion of boulders/cobbles (>64 mm))	<10 %	10-40 % matrix supported	40-95 %	>95 % clast-supported
<b>Elevation</b>	Flat seabed	<64 mm	64 mm - 5 m	>5 m
<b>Extent</b>	<25 m <sup>2</sup>	>25 m <sup>2</sup>		
<b>Biota</b>	Dominated by infaunal species			>80 % of species present composed of epibiotical species

Biotope mosaics were assigned according to guidelines set out by Parry, 2015. In these video segments more than one distinct substrate type was identified to be occurring in a patchwork, where patches were too small to be considered a separate biotope (<25m<sup>2</sup> as a working guide), but too large to be considered a feature of the main biotope. A rock / sediment mosaic was assigned to video segments where significant proportions of both rock (cobbles >64mm, boulders and bedrock) with any type of sediment (gravel, sand, mud etc.) were recorded e.g. bedrock outcrops surrounded by fine sand. In these areas, two biotopes were assigned and recorded with the most predominant biotope noted first (e.g. 'A3.116 / A5.23 mosaic').

A total of 36 video tows were analysed, of which 27 were split into separate segments representing distinctly different habitats. A total of 103 video segments were therefore analysed.

## 2.3 Mapping

All thematic maps presented in this report were created using ArcGIS 10.2.2 under **OceanEcology**'s user licence. All ArcGIS .shp files (also converted into MapInfo .tab files) accompany this report.

## 2.4 Quality Assurance

A total of 22 separate video segments were reanalysed by a separate **OceanEcology** ecologist for QA purposes (10%). Whilst the individual stations were selected randomly, at least one station from each of the three reef areas were selected to be reanalysed for QA. The majority of differences identified were related to percentage coverage of substrate type (e.g. bedrock, pebbles, sands) and the start and end points of segments. Whilst there were also some minor differences in species occurrences and sediment contributions noted between the original and QA analysis they were not significant enough to result in different biotopes being assigned or habitat sub-features being amended on any occasion.

# 3. RESULTS

## 3.1 Biotope Classification

The visual quality of the videos collected across Bigbury Bay and the Pinnacles was generally 'good' allowing for biotope determination and recording of the presence of Annex I habitats and species of interest for every video segment with confidence.

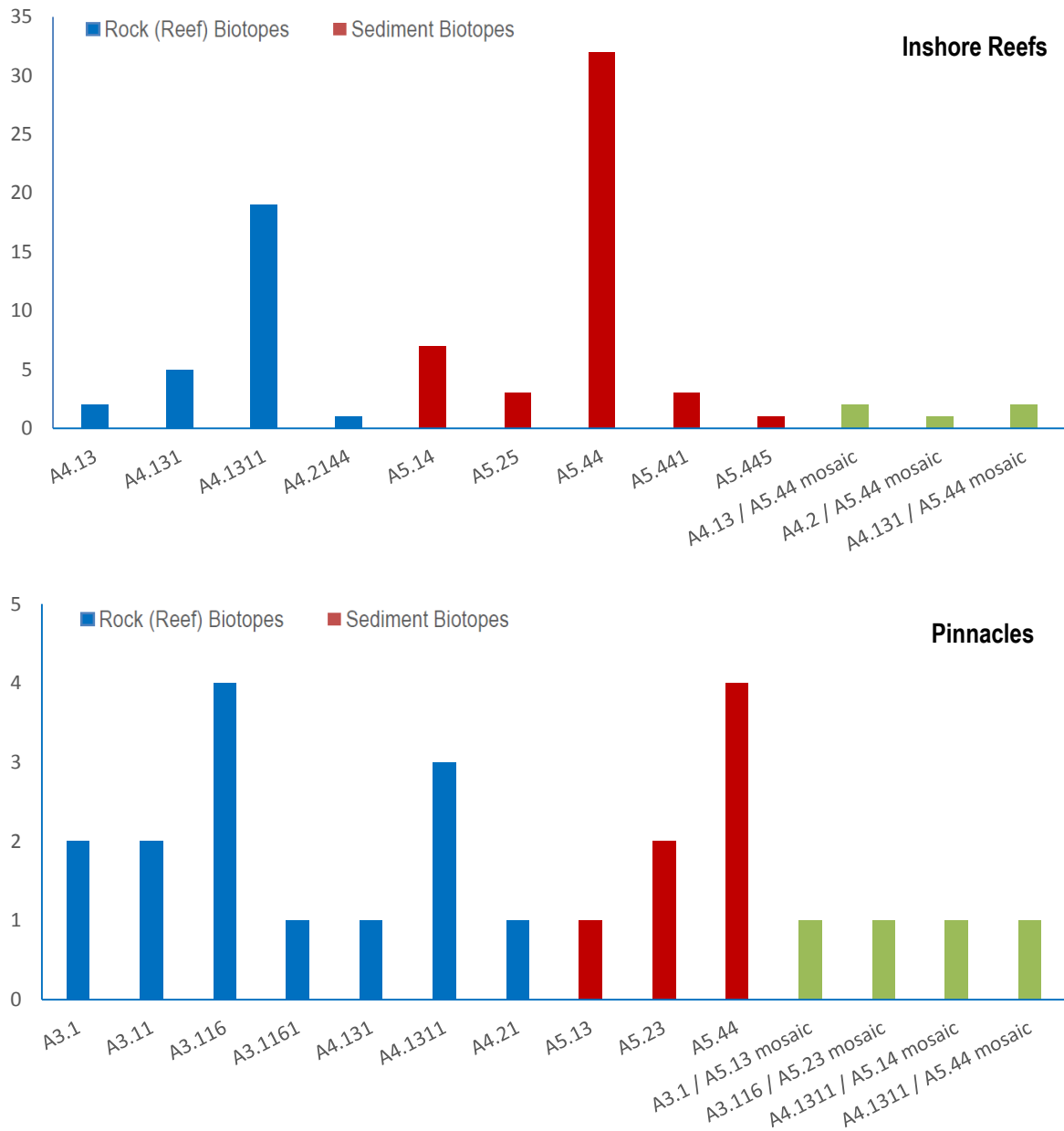
A total of six broad scale habitats were identified across the survey area with the majority of stations being characterised by circalittoral rock. Within these broad scale habitats, 16 biotopes at EUNIS level 4 or above were identified and are mapped in Figures 4 – 6. The majority of sediment habitats were characterised by 'A5.44 Circalittoral mixed sediment' and the majority of rock habitats identified as 'A4.1311 *Eunicella verrucosa* & *Pentapora foliacea* on wave-exposed circalittoral rock'.

### Inshore Reef

The Bigbury Bay onshore reef area was characterised by extensive high energy bedrock reef dominated by macrophytes including kelp, foliose red algae and the brown algae, *Dictyopterus polypodioides* (formerly *Dictyopterus membranacea*), with sponges, faunal crusts and echinoderms frequently observed. Small areas of fine sand and coarse sediments were recorded amongst the bedrock reef. Below the infralittoral zone were areas of heavily encrusted rock representative of the biotope 'A4.1311 *Eunicella verrucosa* & *Pentapora foliacea* on wave-exposed circalittoral rock' and areas of coarse and mixed sediments.

### Pinnacles (Offshore Reef)

The Pinnacles reef areas were generally characterised by expanses of low rock covered with a sediment veneer and large outcrops surrounded by areas of muddy sands and gravels. The majority of rock habitats in the offshore reef area were recorded as 'A4.1311 *Eunicella verrucosa* & *Pentapora foliacea* on wave-exposed circalittoral rock' characterised by high densities of *E. verrucosa* forming expansive meadows with *Alcyonium digitatum* among dense hydroid/bryozoan turf. Brittlestar beds and a community characterised by parchment tube worms (Chaetopteridae) were also noted. Surrounding the rocky biotopes in the offshore reef area were expanses of sediment biotopes characterised by muddy sand and gravel recorded as 'A5.44 Circalittoral mixed sediment'. The epifaunal communities in these areas were characterised by echinoderms including brittlestars (*Ophiocarina nigra* and *Ophiothrix fragilis*) and occasional *Marthasterias glacialis*. In some mixed sediment areas numerous burrowing anemones (Ceriantharia) were recorded suggesting these areas were representative of the biotope 'A5.441 *Cerianthus lloydii* & other burrowing anemones in circalittoral muddy mixed sediment'.



**Figure 3.** Histograms showing the frequency of occurrence of each of the EUNIS biotopes identified across the SPPSE SAC inshore reefs (top) and Pinnacles offshore reefs (bottom).



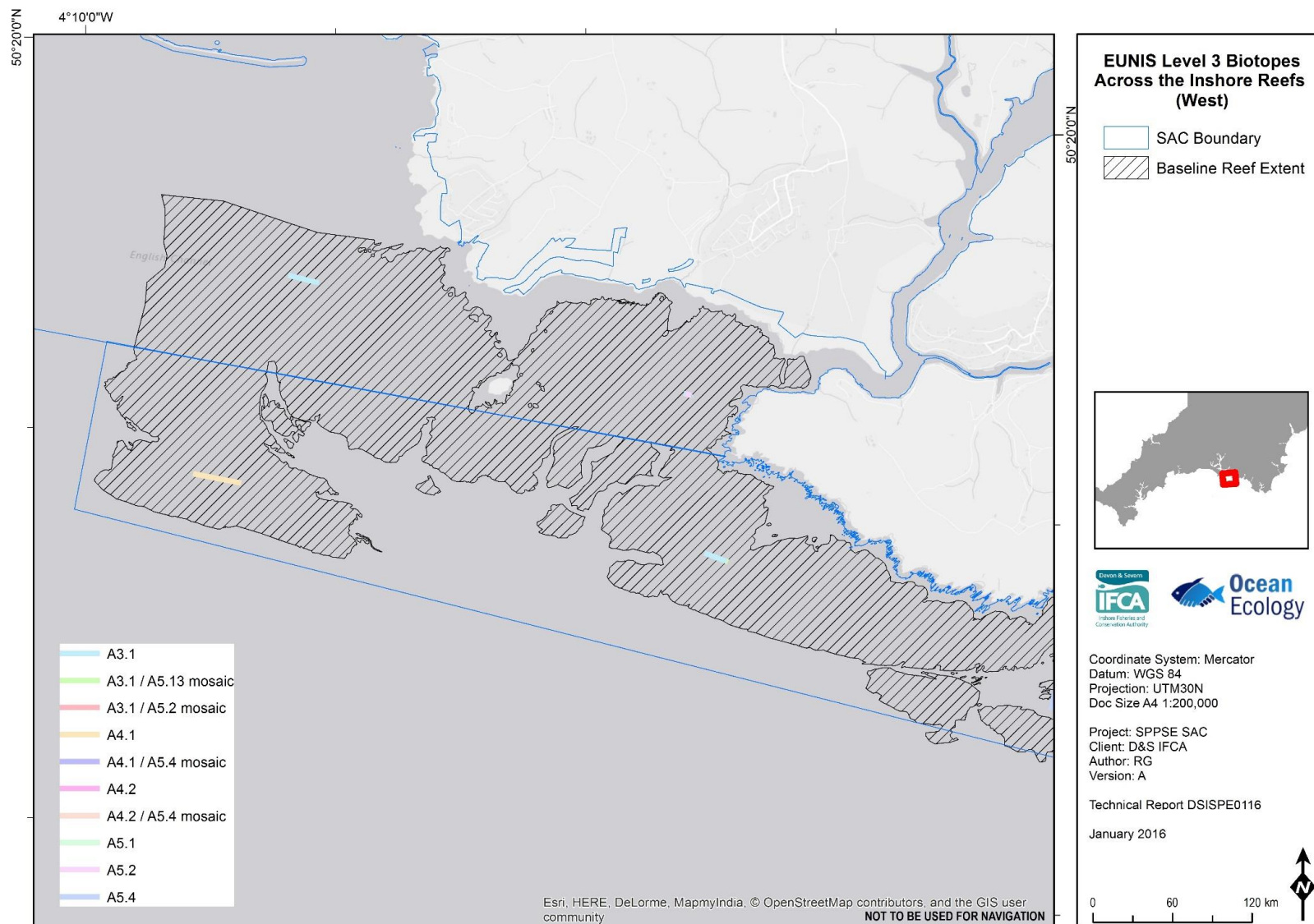
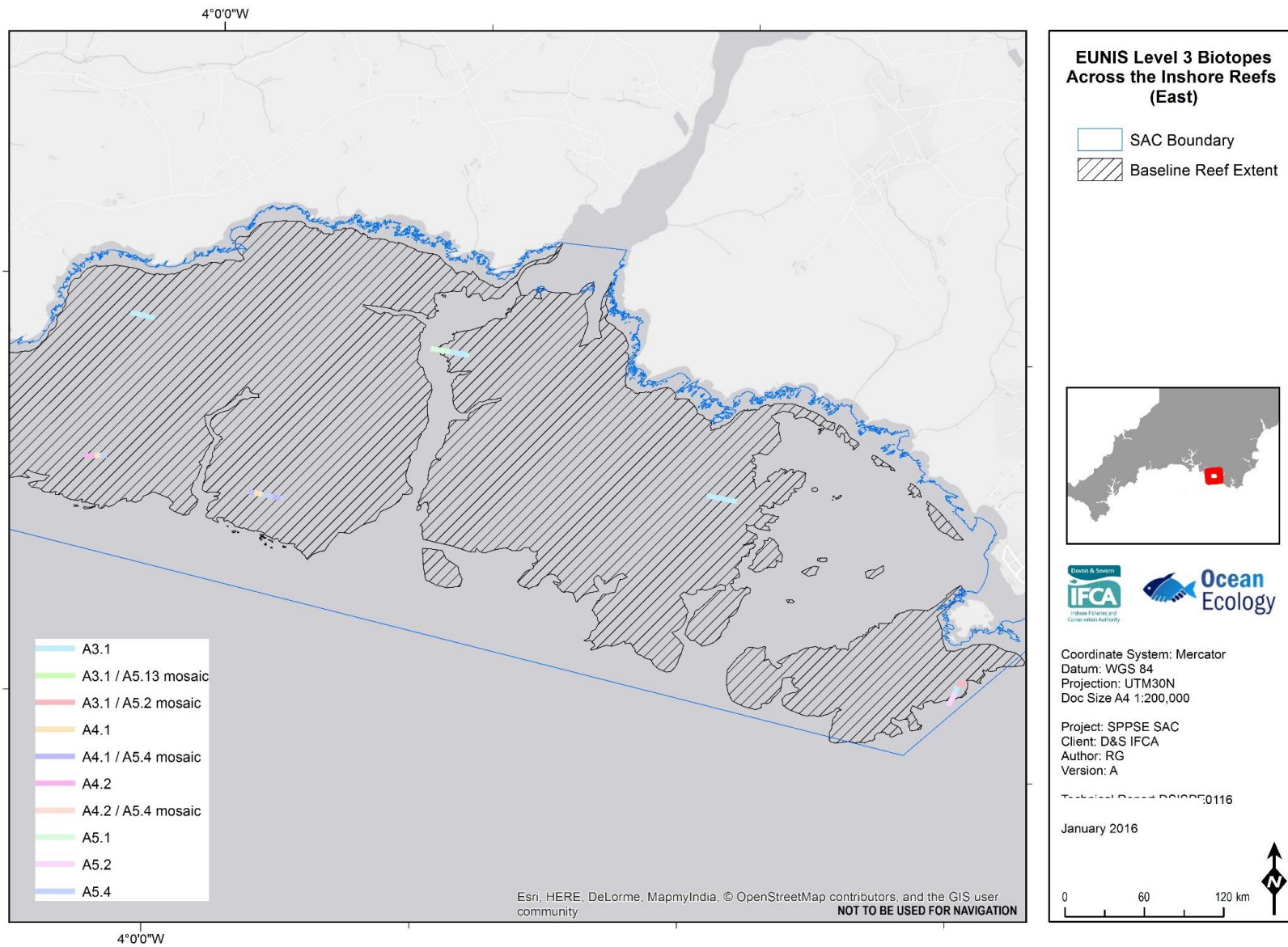
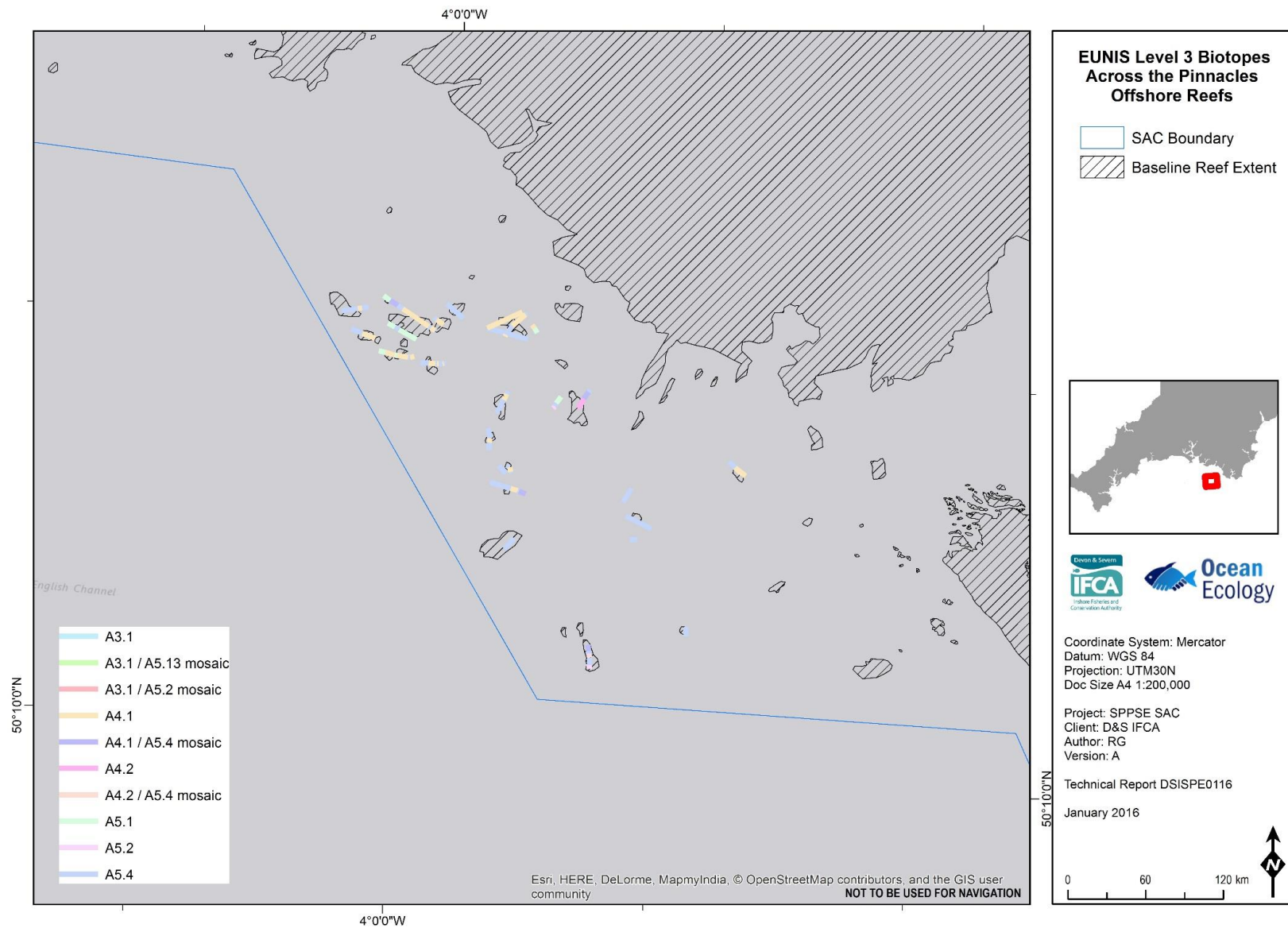


Figure 4. Map illustrating the EUNIS biotopes identified along each of the video tows sampled across the inshore reefs within the SPPSE and PSE SACs (west).





**Figure 5.** Map illustrating the EUNIS biotores identified along each of the video tows sampled across the inshore reefs within the SPPSE SAC (east).





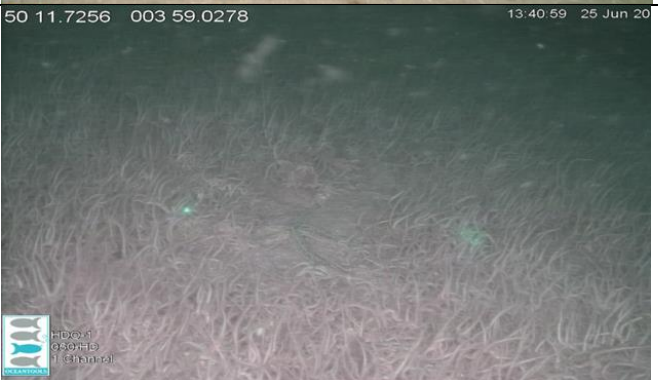
**Figure 6.** Map illustrating the EUNIS biotopes identified along each of the video tows sampled across Pinnacles (offshore reefs) within the SPPSE SAC.

### 3.2 Sediment Biotopes

A number of sediment biotopes were identified across the inshore and Pinnacles reef areas which included coarse sediments, sands and mixed sediments. Examples of each of the biotopes recorded are provided in Table 2.

**Table 2.** Sediment biotopes identified across the SPPSE and PSE SACs.

EUNIS Code	MNCR Code	MNCR Descriptor	Example Video Still
A5.13	SS.SCS.ICS	Infralittoral coarse sediment	
A5.14	SS.SCS.CCS	Cirralittoral coarse sediment	
A5.23	SS.SSa.IFiSa	Infralittoral fine sand	
A5.25	SS.SSa.CFiSa	Cirralittoral fine sand	

A5.44	SS.SMx.CMx	Cirralittoral mixed sediment	
A5.441	SS.SMx.CMx. C1loMx	<i>Cerianthus lloydii</i> & other burrowing anemones in cirralittoral muddy mixed sediment	
A5.445	SS.SMx.CMx. OphMx	<i>Ophiothrix fragilis</i> and/or <i>Ophiocomina nigra</i> brittlestar beds on sublittoral mixed sediment	





### 3.3 Rock Biotopes, Annex I Features & Sub-Features




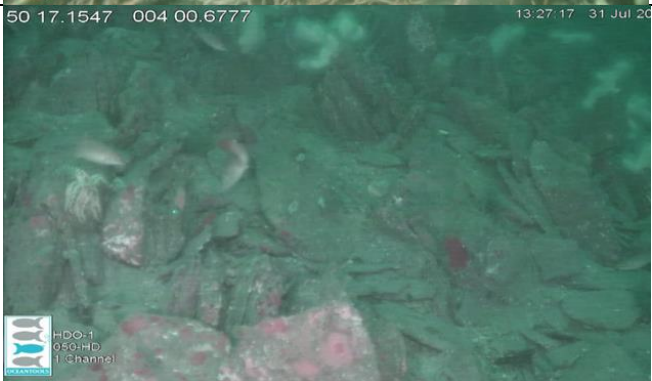
Annex I 'Reef' was noted in 28 of the 36 tows and 46 of the 103 resulting segments. The sub-feature 'Bedrock Reef' was noted in 41 of these records whilst 'Stony Reef' was recorded in 12 segments. Both sub-features were recorded in 7 segments.

Examples of each of the rock biotopes are provided in Table 3.



**Table 3.** Rock/reef biotopes identified across the SPPSE and PSE SACs.

EUNIS Code	MNCR Code	MNCR Descriptor	Example Video Still
A3.1	IR.HIR	High energy infralittoral rock	
A3.11	IR.HIR.KFaR	Kelp with cushion fauna and/or foliose red seaweeds	
A3.116	IR.HIR.KFaR.FoR	Foliose red seaweeds on exposed lower infralittoral rock	
A3.1161	IR.HIR.KFaR.FoR.Dic	Foliose red seaweeds with dense <i>Dictyota dichotoma</i> and/or <i>Dictyopteris membranacea</i> on exposed lower infralittoral rock	

A4.13	CR.HCR.XFa	Mixed faunal turf communities	 <p>50 11.0466 003 59.2507 11:25:44 09 Jul 20</p> <p>HDO-1 050-HD 1 Channel</p>
A4.131	CR.HCR.XFa. ByErSp	Bryozoan turf & erect sponges on tide-swept circalittoral rock	 <p>50 17.1528 004 01.7401 14:08:15 11 Aug 20</p> <p>HDO-1 050-HD 1 Channel</p>
A4.1311	CR.HCR.XFa. ByErSp.Eun	<i>Eunicella verrucosa</i> & <i>Pentapora foliacea</i> on wave-exposed circalittoral rock	 <p>50 12.1052 003 59.4106 14:32:09 29 Jun 20</p> <p>HDO-1 050-HD 1 Channel</p>
A4.21	CR.MCR.EcCr	Echinoderms & crustose communities	 <p>50 17.1547 004 00.6777 13:27:17 31 Jul 20</p> <p>HDO-1 050-HD 1 Channel</p>





A4.2144	CR.MCR.EcCr .FaAlCr.Bri	Brittlestars on faunal & algal encrusted exposed to moderately wave- exposed circalittoral rock	
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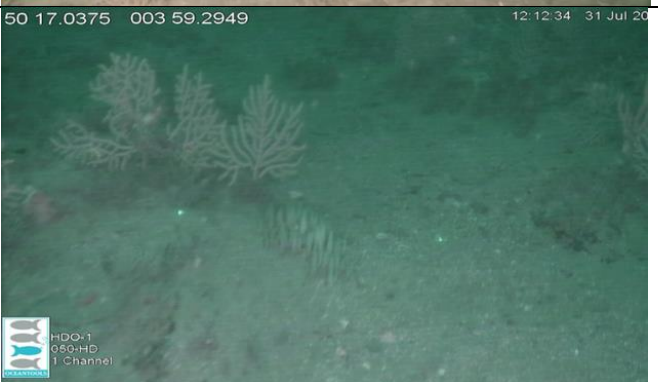

### 3.4 Rock / Sediment Mosaic Biotopes

Rock / sediment mosaic biotopes were recorded in 7 of the 36 tows and 9 of the resulting 103 segments. These areas were all characterised by a substrate patchwork of rock and sediment representative of two distinct biotopes.

Examples of the rock / sediment mosaic biotopes are provided in Table 4.

**Table 4.** Rock / sediment mosaic biotopes identified across the SPPSE and PSE SACs.

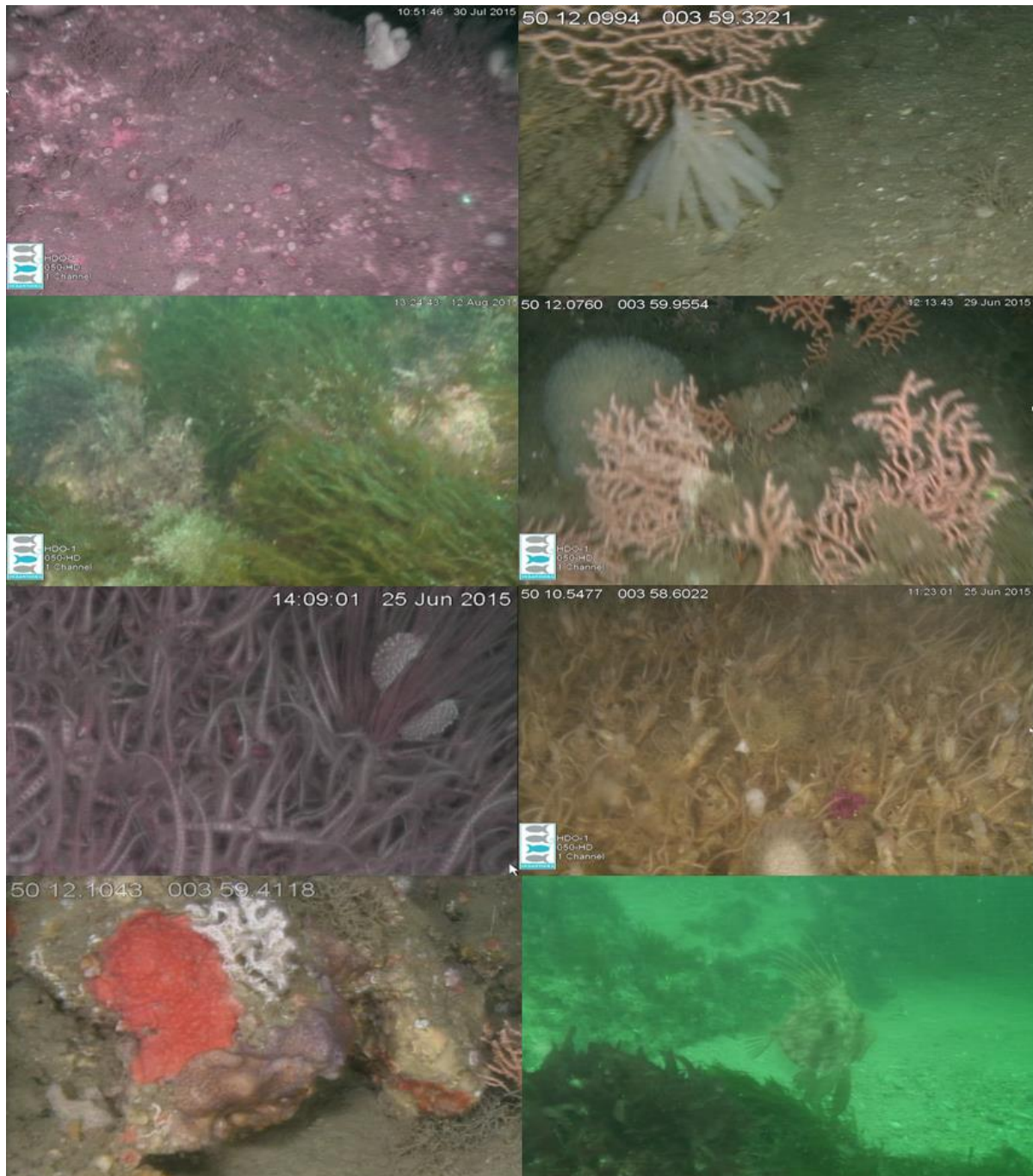
EUNIS Code	MNCR Code	MNCR Descriptor	Example Video Still
A3.1 / A5.13 mosaic	IR.HIR / SS.SCS.ICS mosaic	High energy infralittoral rock / Infralittoral coarse sediment mosaic	
A3.116 / A5.23 mosaic	IR.HIR.KFaR. FoR / SS.Ssa.IFiSa mosaic	Foliose red seaweeds on exposed lower infralittoral rock / Infralittoral fine sand	

A4.13 / A5.44 mosaic	CR.HCR.Xfa / SS.SMx.CMx mosaic	Mixed faunal turf communities / Circalittoral mixed sediment	
A4.131 / A5.44 mosaic	CR.HCR.XFa .ByErSp / SS.SMx.CMx mosaic	Bryozoan turf & erect sponges on tide-swept circalittoral rock / Circalittoral mixed sediment.	
A4.1311 / A5.14 mosaic	CR.HCR.XFa .ByErSp.Eun / SS.SCS.CCS mosaic	<i>Eunicella verrucosa</i> & <i>Pentapora foliacea</i> on wave-exposed circalittoral rock / Circalittoral coarse sediment	
A4.2 / A5.44 mosaic	CR.MCR / SS.SMx.CMx mosaic	Moderate energy circalittoral rock / Circalittoral mixed sediment	

### 3.5 Other Notable Species

The key species of conservation interest noted during the analysis of the video footage was the pink sea fan, *E. verrucosa*, (a Section 41/42 Species of Principal Importance) which formed dense meadows across large areas of bedrock reef.

Images of other species of interest are shown below in Plate 1.

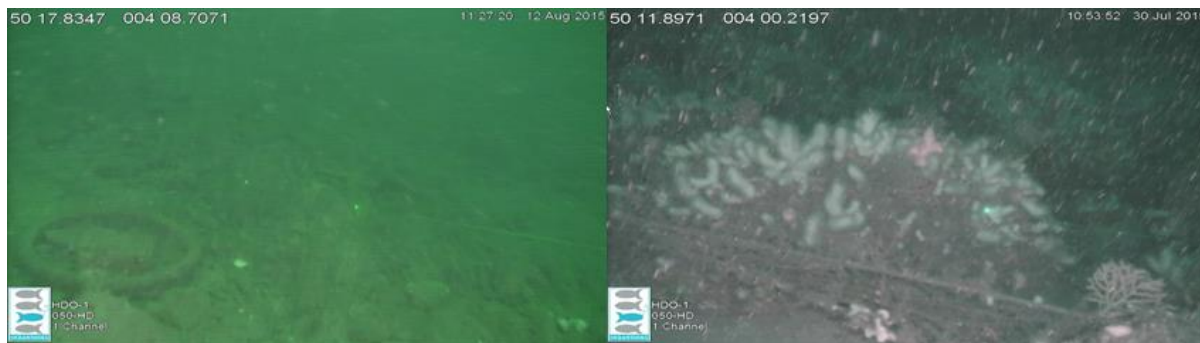


**Plate 1.** Notable species recorded during the analysis of video tows from across the SPPSE and PSE SACs. Top left: *Caryophyllia smithii*. Top right: Cephalopoda eggs. Upper middle left: *Dictyopteris polypodioides* (formerly *membranacea*). Upper middle right: *Eunicella verrucosa* and *Diazona violacea*. Lower middle left: unidentified nudibranch species on *Nemertesia* sp. Lower middle right: Chaetopterid worm tubes. Bottom left: encrusting fauna and coral worm tubes (Serpulidae). Bottom right: *Zeus faber*.



### 3.6 Anthropogenic Impacts

Very little evidence of physical damage or anthropogenic impact was observed during the analysis of the video tows. This was corroborated by relatively few *E. verrucosa* colonies showing possible evidence of physical damage. There were however a few observations of discarded waste (tyre) and possibly 'active' fishing gear (netting) as shown in Plate 2.



**Plate 2.** Waste litter and possible fishing gear noted in the video tow footage collected across the SPPSE and PSE SACs.

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