



# OceanEcology

Report No: DSISPE0215

## Start Point to Plymouth Sound & Eddystone SAC Seabed Imagery Analysis & *Eunicella verrucosa* Condition Assessment – Summary Report

Prepared for



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## 1. INTRODUCTION

**OceanEcology** were commissioned by Devon and Severn IFCA (D&S IFCA) to undertake the analysis of 25 hours of underwater video footage collected during 2013 and 2014 in order to ground truth the location and extent of designated features in the Start Point to Plymouth Sound and Eddystone SAC (Figure 2). The analysis involved assigning and mapping EUNIS / MNCR biotope classifications to underwater video tows collected across the Start Point to West Rutts reefs as defined by Natural England (2013). These were split into the 'Western', 'Central' and 'Eastern' reefs. Particular reference was given to the bedrock reef sub-feature and its association with the corresponding biotopes. As an addition to this analysis, a pink sea fan (*Eunicella verrucosa*) condition assessment was undertaken in order to provide Natural England information on the distribution and condition of this fragile species to inform their ongoing condition assessment of the site.

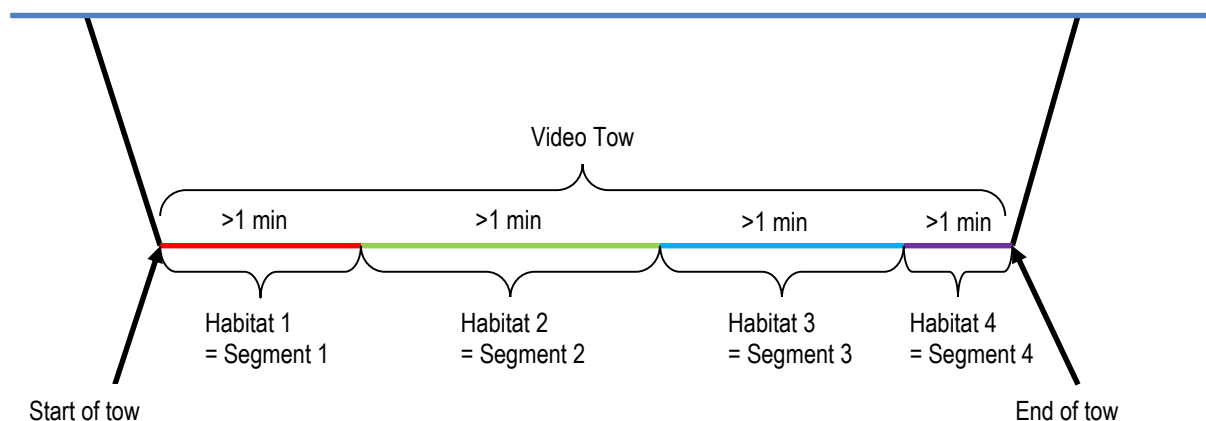
This report therefore provides a summary of the analytical techniques employed during the analysis of the underwater video tows, the biotopes encountered, the extent of the bedrock reef sub-feature and the presence and condition of *E. verrucosa* across the site.

## 2. METHODS

### 2.1 Video Tow Analysis

All analysis was undertaken in line with the guidelines provided in the 'Cefas Video and Stills Processing Protocol' (Annex 1) and **OceanEcology's** in house 'Seabed Imagery Processing, Analysis & QA SOP'. In summary the analysis followed the steps described below.

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 initially viewed rapidly (at approximately 4 x normal speed) in order to segment it 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.

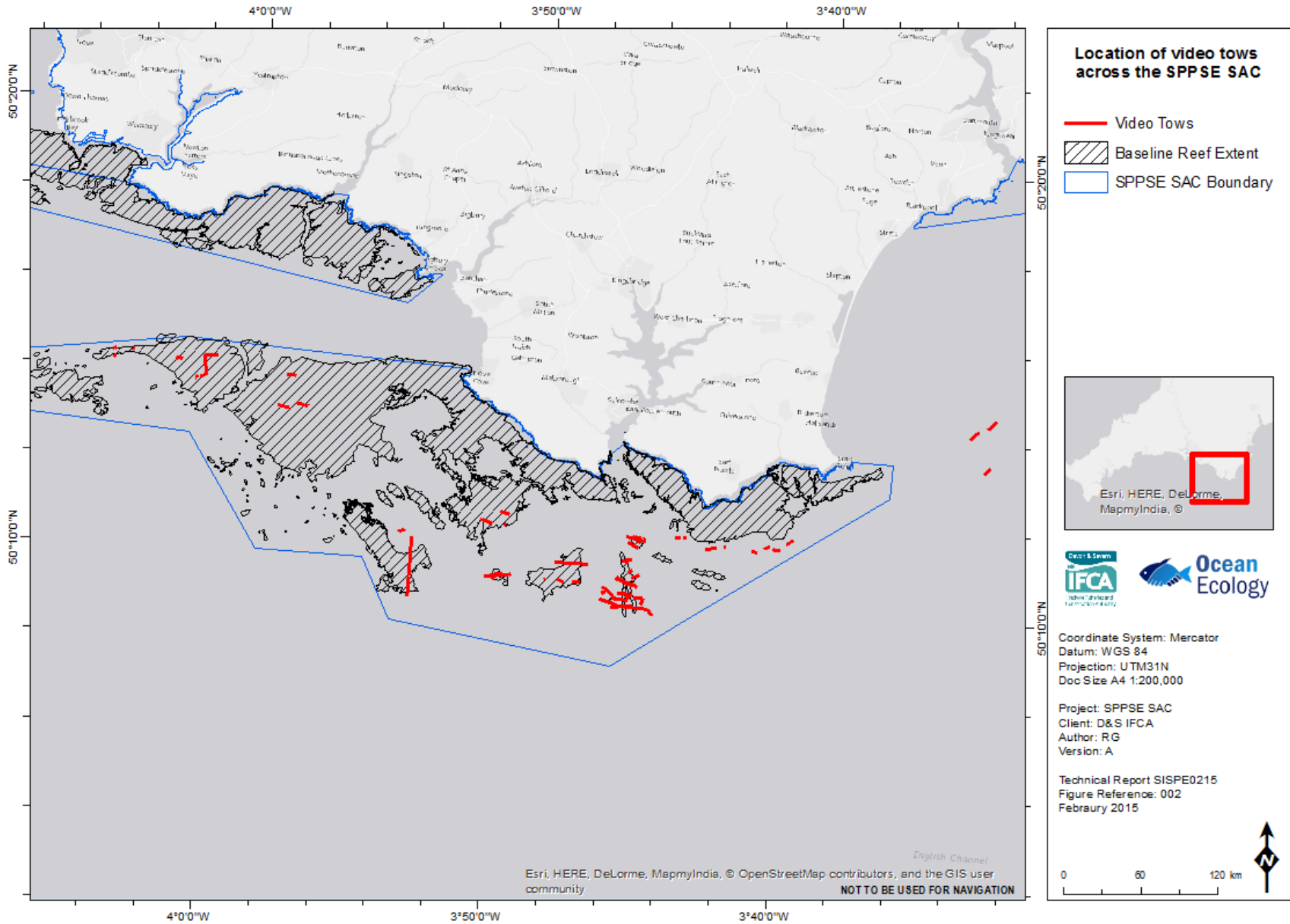


Figure 2. Map illustrating the locations of video tows sampled across the SPPSE SAC during 2013-2014.

The tow was then viewed in 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)
- Duration
- Start and end positions
- Depth (when available)
- Percentage substrate coverage (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, modelled EUNIS categories for each of the video and still locations were considered from the UKSeaMap 2010 predictive model (<http://jncc.defra.gov.uk/page-5534>). Therefore, for each segment, it was possible to determine the possible BS 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) whilst the extent was identified to be  $>25$  m<sup>2</sup> from the video footage (Irving, 2009). When  $>30$  % coverage was constituted by granules larger than pebbles a rock biotope and reef habitat was noted.

A total of 78 video tows were analysed of which 47 were split into separate segments representing distinctly different habitats resulting in the analysis of a total of 218 video segments, 24 of which were deemed inadequate for analysis due to poor visual quality.

## 2.2 *Eunicella verrucosa* Condition Assessment

Each *E. verrucosa* colony was assessed in line with the condition assessment criteria of Irving & Northern (2012) as outlined in modified Table 1 below, which has been adapted for application to towed video rather than dive photography. A score of between 1 and 5 was attributed to each individual sea fan depending on the degree of covering from epibiota. Where video quality was inadequate to determine the condition, 'not discernible' was noted. Notes were also recorded for each colony where physical damage was evident. Finally, a confidence score was recorded in relation to the visual quality of the image ranging from 1 (low level of confidence) to 5 (high level of confidence) as described in Table 1.

A still image was taken from the video of each *E. verrucosa* colony (where possible) and corresponding details of station/segment number, time and position were recorded for subsequent interpretation and mapping.

## 2.3 Mapping

All thematic maps presented in this report were created using ArcGIS 10.2.2 under OceanEcology's user licence and all admiralty charts used as basemaps are presented under OceanEcology's UK Hydrographic Office (UKHO) Copyright Licence No: 17400. 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




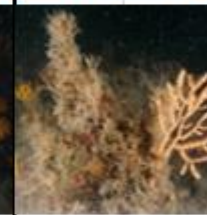
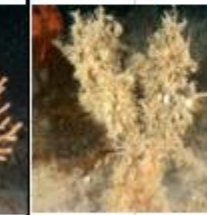







of substrate type (e.g. bedrock, pebbles, sands) and the start and end points of segments. Whilst there were also some minor differences in species occurrences and sediment contributions noted between the original and QA analysis they were not significant enough to result in different biotopes being assigned on any occasion.

**Table 1.** *E. verrucosa* condition assessment matrix (adapted from Irving & Northern, 2012).

Score	Condition Assessment		Confidence	
	% cover	Description	Quality	Description
5	Pristine or < 5%	No epibiota (or hardly any).	Excellent	Whole colony visible and associated species visible (e.g. <i>Tritonia nilsodhneri</i> , epibiota).
4	5% - 20%	Partial covering of sea fan by epibiota.	Good	Most of colony visible, associated species may be visible, suboptimal angle of view.
3	20% - 50%	Up to half of sea fan affected by epibiota.	Moderate	Partially visible, obscured view due to other fauna, acute angle or shadowing.
2	50% - 80%	A large proportion of the sea fan has epibiota covering it, with only a small amount of 'healthy' fan apparent.	Poor	Poor resolution due to blurring, inadequate lighting or turbidity, condition assessment possible.
1	> 80%	Dense cover (almost total) of epibiota.	Very poor	Blurred image or high turbidity, <i>E. verrucosa</i> identifiable but no condition assessment possible.

	5	4	3	2	1
	Pristine or < 5% cover	5 – 20% cover	20 – 50% cover	50 – 80% cover	> 80% cover
Condition Score					
Confidence Score	Excellent	Good	Moderate	Poor	Very poor
					

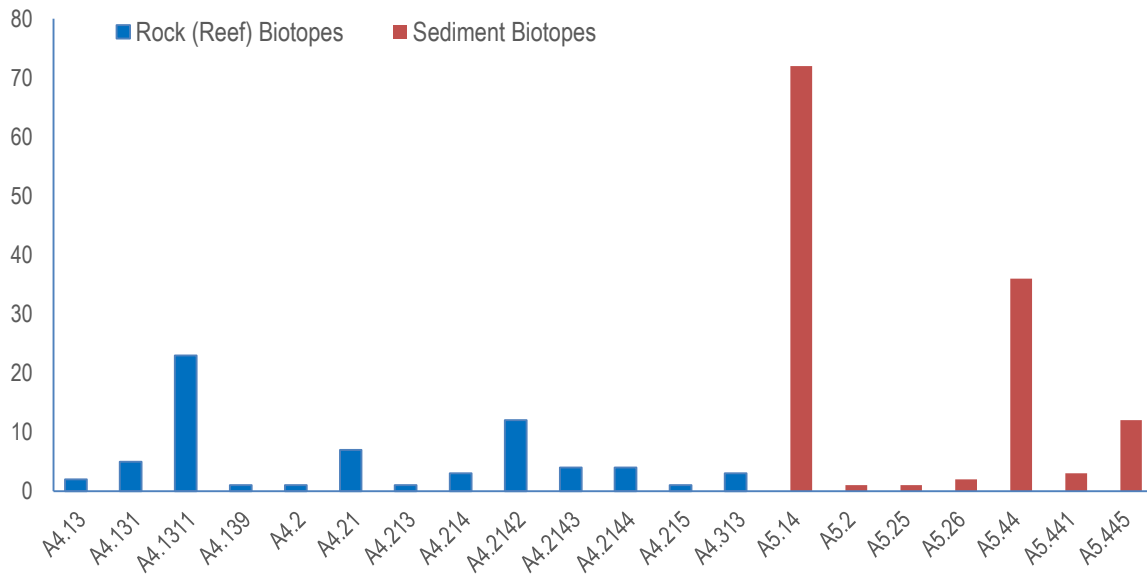
### 3. RESULTS

#### 3.1 Biotope Classification

The visual quality of the videos collected across the SPPSE SAC was generally good allowing for biotope determination and recording the presence of Annex I habitats and species of interest. A number of the video tows (24) were deemed 'inadequate' as a result of suspended sediments or the camera array being held in the water column away from the seabed. No biotopes were recorded for these video segments.

A total of 6 BSHs were identified across the survey area with the majority of stations being characterised by circalittoral rock. The 6 BSHs corresponded to 17 biotopes at EUNIS Level 4 or above (see Tables 2 & 3) all of which are mapped in Figures 4-6. As shown in Figure 3 the majority of the sediment habitats encountered across

the site were characterised as 'A5.14 Circalittoral coarse sediment' and 'A5.445 *Ophiothrix fragilis* and/or *Ophiocolina nigra* brittlestar beds on sublittoral mixed sediment'. The most frequently occurring rock biotopes were those dominated by the pink sea fan, *E. verrucosa*, and dead man's fingers, *Alcyonium digitatum*.



**Figure 3.** Histogram showing the frequency of occurrence of each of the EUNIS biotopes identified across the SPPSE SAC.

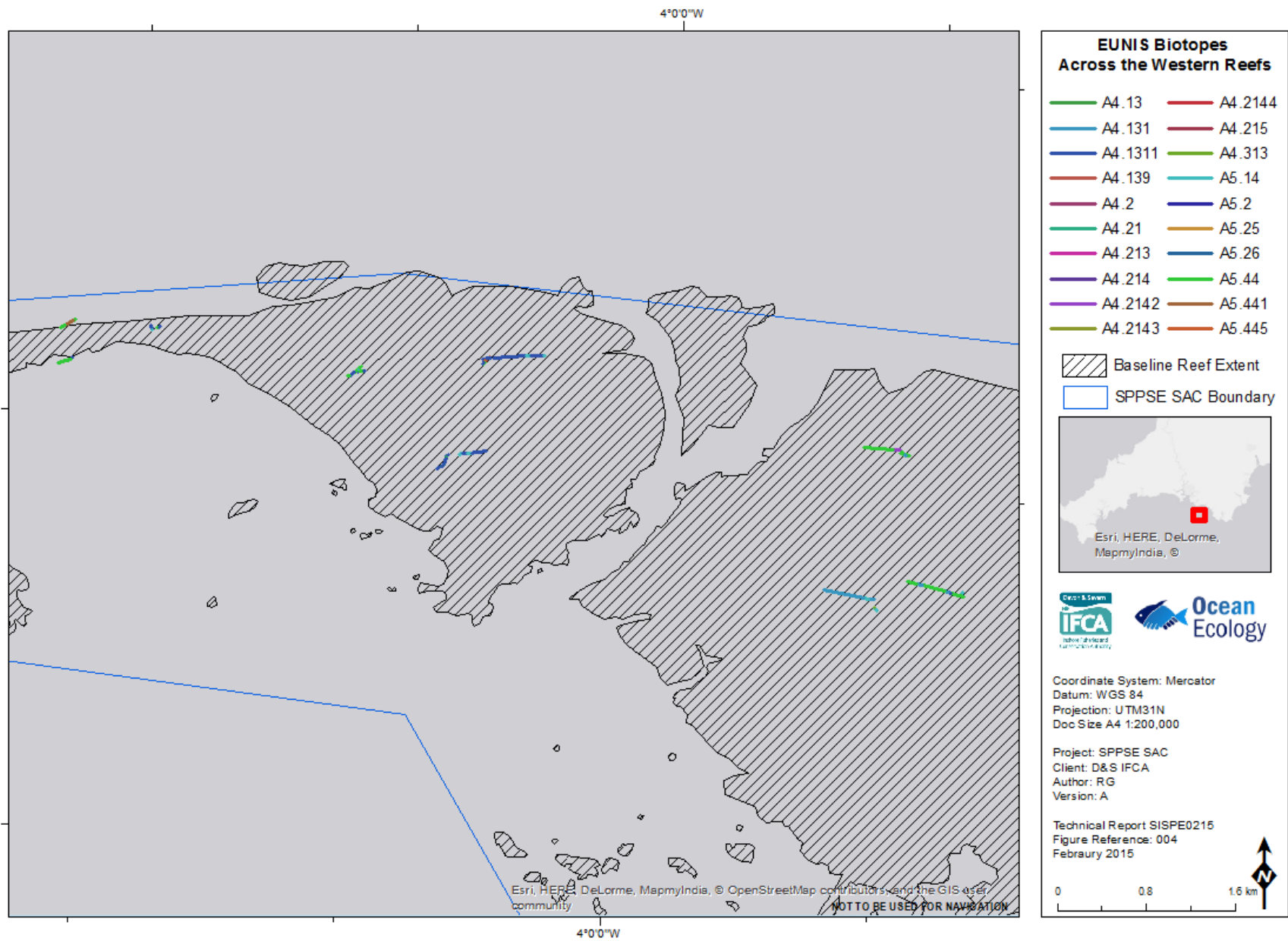


Figure 4. Map illustrating the EUNIS biotopes identified along each of the video tows sampled across the Western Start Point to West Rutts Reefs.



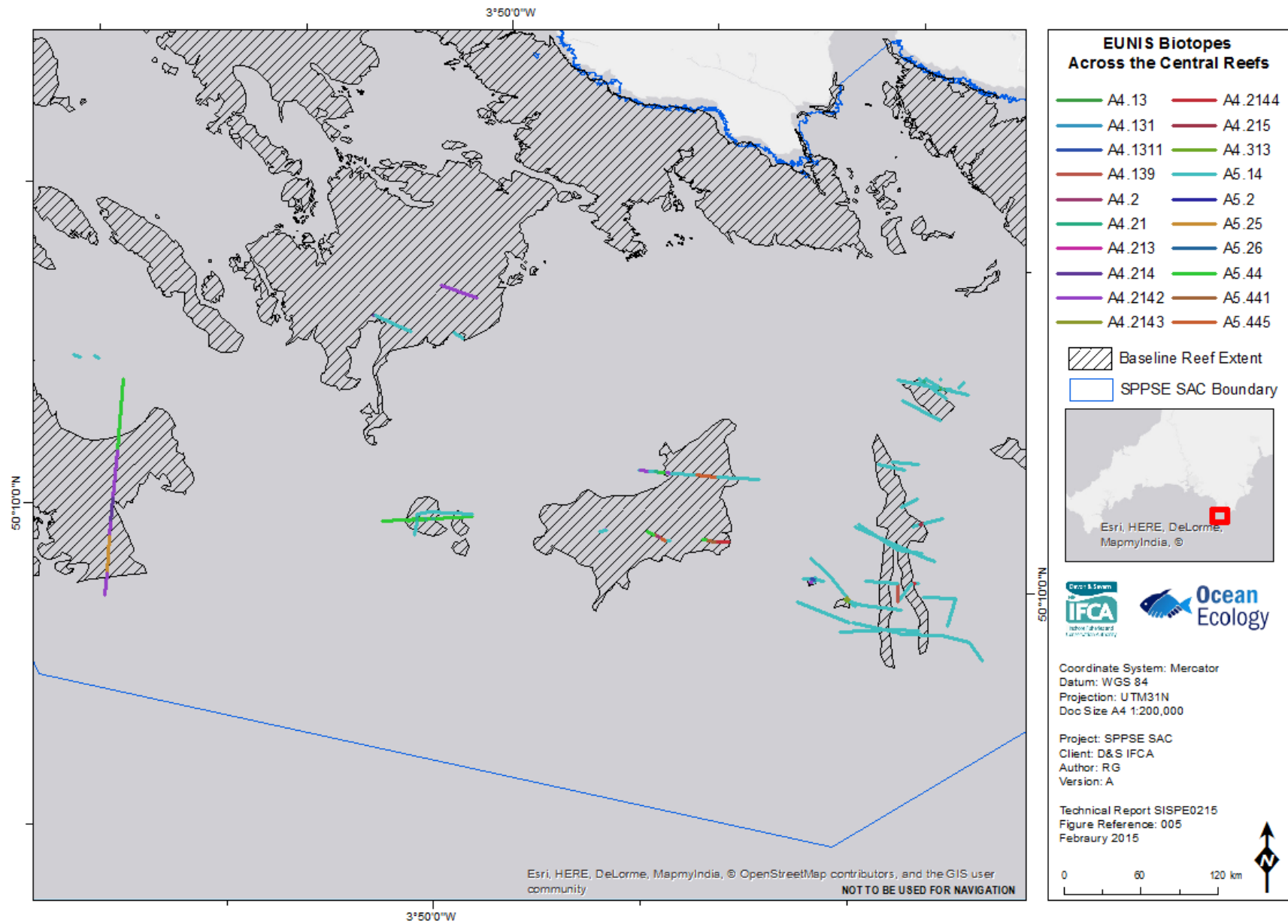


Figure 5. Map illustrating the EUNIS biotopes identified along each of the video tows sampled across the Central Start Point to West Rutts Reefs.

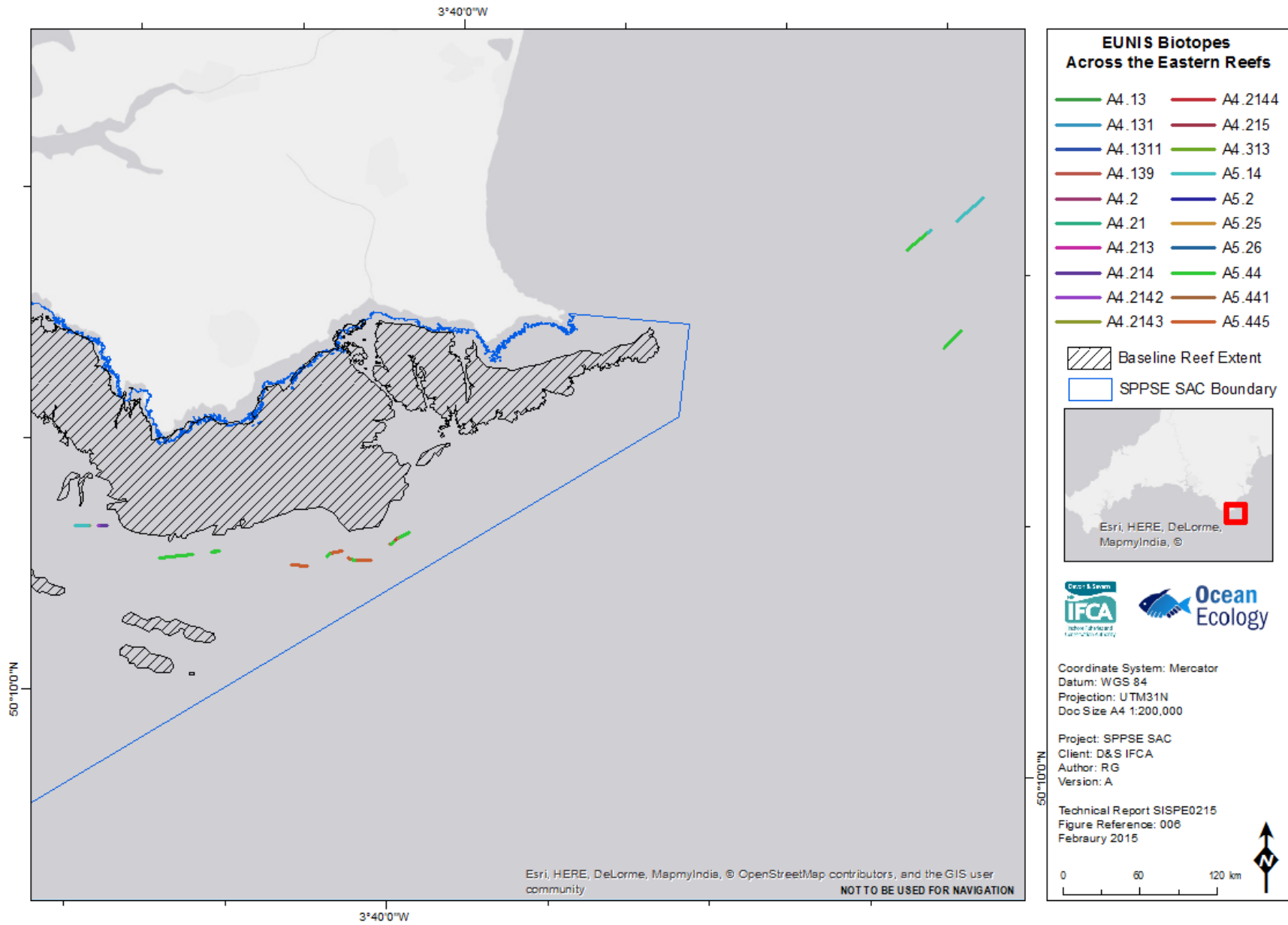








Figure 6. Map illustrating the EUNIS biotopes identified along each of the video tows sampled across the Eastern Start Point to West Rutts Reefs.

### 3.2 Sediment Biotores

A number of sediment biotores were identified across the SPPSE SAC which included coarse sediments, sands and mixed sediments. Examples of each of the biotores recorded are provided below.

**Table 2.** Sediment biotores identified across the SPPSE SAC.





EUNIS Code	MNCR Code	MNCR Descriptor	Example Video Still
A5.14	SS.SCS.CCS	Circolittoral coarse sediment	
A5.2	SS.SSa	Sublittoral sands and muddy sands	
A5.26	SS.SSa.CMuSa	Circolittoral muddy sand	
A5.44	SS.SMx.CMx	Circolittoral mixed sediment	
A5.441	SS.SMx.CMx.CIoMx	<i>Cerianthus lloydii</i> and other burrowing anemones in circolittoral 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	
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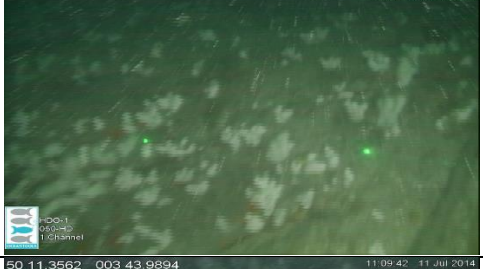


### 3.3 Rock Biotopes, Annex I Features & Sub-features



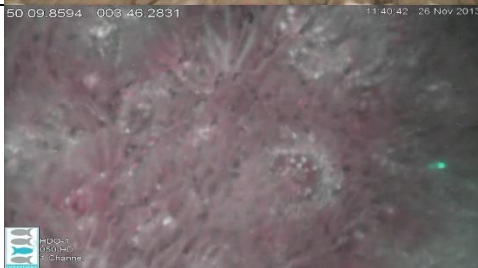
Annex I 'Reef' was noted in 37 of the 78 tows and 67 of the 218 resulting segments. All records of 'Reef' were characterised as the sub-feature 'Bedrock Reef' apart from a single segment (See B01C009\_S3 in accompanying PROFORMA) where 'Stony Reef' (Irving, 2009) was recorded as a patch between mixed sediment and bedrock reef. A wide variety of low, moderate and high energy circalittoral rock biotopes were associated with the 'Bedrock Reef' sub-feature. Examples of each of the biotopes recorded are provided below.

**Table 3.** Rock/reef biotopes identified across the SPPSE SAC.

EUNIS Code	MNCR Code	MNCR Descriptor	Example Video Still
A4.13	CR.HCR.XFa	Mixed faunal turf communities	
A4.131	CR.HCR.XFa.ByErSp	Bryozoan turf and erect sponges on tide-swept circalittoral rock	
A4.1311	CR.HCR.XFa.ByErSp.Eun	<i>Eunicella verrucosa</i> and <i>Pentapora foliacea</i> on wave-exposed circalittoral rock	
A4.139	CR.HCR.XFa.SpAnVt	Sponges & anemones on vertical circalittoral bedrock	



A4.2	CR.MCR	Moderate energy circalittoral rock	
A4.21	CR.MCR.EcCr	Echinoderms and crustose communities	
A4.213	CR.MCR.EcCr.UrtScr	<i>Urticina felina</i> and sand-tolerant fauna on sand-scoured or covered circalittoral rock	
A4.214	CR.MCR.EcCr.FaAlCr	Faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock	
A4.2142	CR.MCR.EcCr.FaAlCr.Adig	<i>Alcyonium digitatum</i> , <i>Pomatoceros triqueter</i> , algal & bryozoan crusts on wave-exposed circalittoral rock	
A4.2143	CR.MCR.EcCr.FaAlCr.Sec	<i>Alcyonium digitatum</i> with <i>Securiflustra securifrons</i> on tide-swept moderately wave-exposed circalittoral rock	

A4.2144	CR.MCR.EcCr.FaAlCr.Bri	Brittlestars on faunal and algal encrusted exposed to moderately wave-exposed circalittoral rock	
A4.215	CR.MCR.EcCr.AdigVt	<i>Alcyonium digitatum</i> and faunal crust communities on vertical circalittoral bedrock	
A4.313	CR.LCR.BrAs.AntAsH	<i>Antedon</i> spp., solitary ascidians and fine hydroids on sheltered circalittoral rock	

### 3.4 *Eunicella verrucosa* Condition Assessment

The pink sea fan, *E. verrucosa*, is a nationally scarce colonial gorgonian species found mainly on upward facing bedrock in shallow warmer waters in southern reaches of the UK where water movement is moderately strong (Hiscock, 2007). It is designated as a Biodiversity Action Plan (BAP) priority species as well as being listed as vulnerable on the International Union for Conservation of Nature and Natural Resources Red List of Threatened Species. The species is long lived and fragile which makes it an excellent indicator of physical damage including the impacts of static and towed fishing gears. Extensive and dense beds of *E. verrucosa* have been noted on the reefs within the SPPSE SAC (Axelsson et al. 2006; Royal Haskoning, 2008; University of Plymouth, 2011, Natural England, 2013). This study therefore included a condition assessment of all *E. verrucosa* colonies encountered in the video tows in line with the methods described in Section 2.2.

A total of 1832 colonies were recorded and assessed across the Start Point to West Rutts Reefs (Figures 7-9). In general the condition of the *E. verrucosa* colonies recorded was high (mean  $\pm$  SE = 3.47  $\pm$  0.02) but due to the relatively poor resolution of stills taken from the video the level of confidence in assigning condition scores was relatively low (mean  $\pm$  SE = 2.76  $\pm$  0.03). The full condition assessment PROFORMA, images and .shp and .tab files accompany this report. Figure 10 illustrates the density of *E. verrucosa* determined by pooling the occurrence of each colony into 5 m grids across the site. This indicates that a greater density of *E. verrucosa* was encountered across the western reefs and that some areas of dense *E. verrucosa* are present in areas not currently mapped as reef. A total of 40 colonies were noted to exhibit possible physical damage, e.g. when branches appeared to be missing. Examples are provided in Plate 1 below.

**Plate 1.** Examples of *E. verrucosa* colonies exhibiting signs of physical damage. Left; B01C011\_00006. Centre: B01C011\_00008. Right: B01C013\_00099.





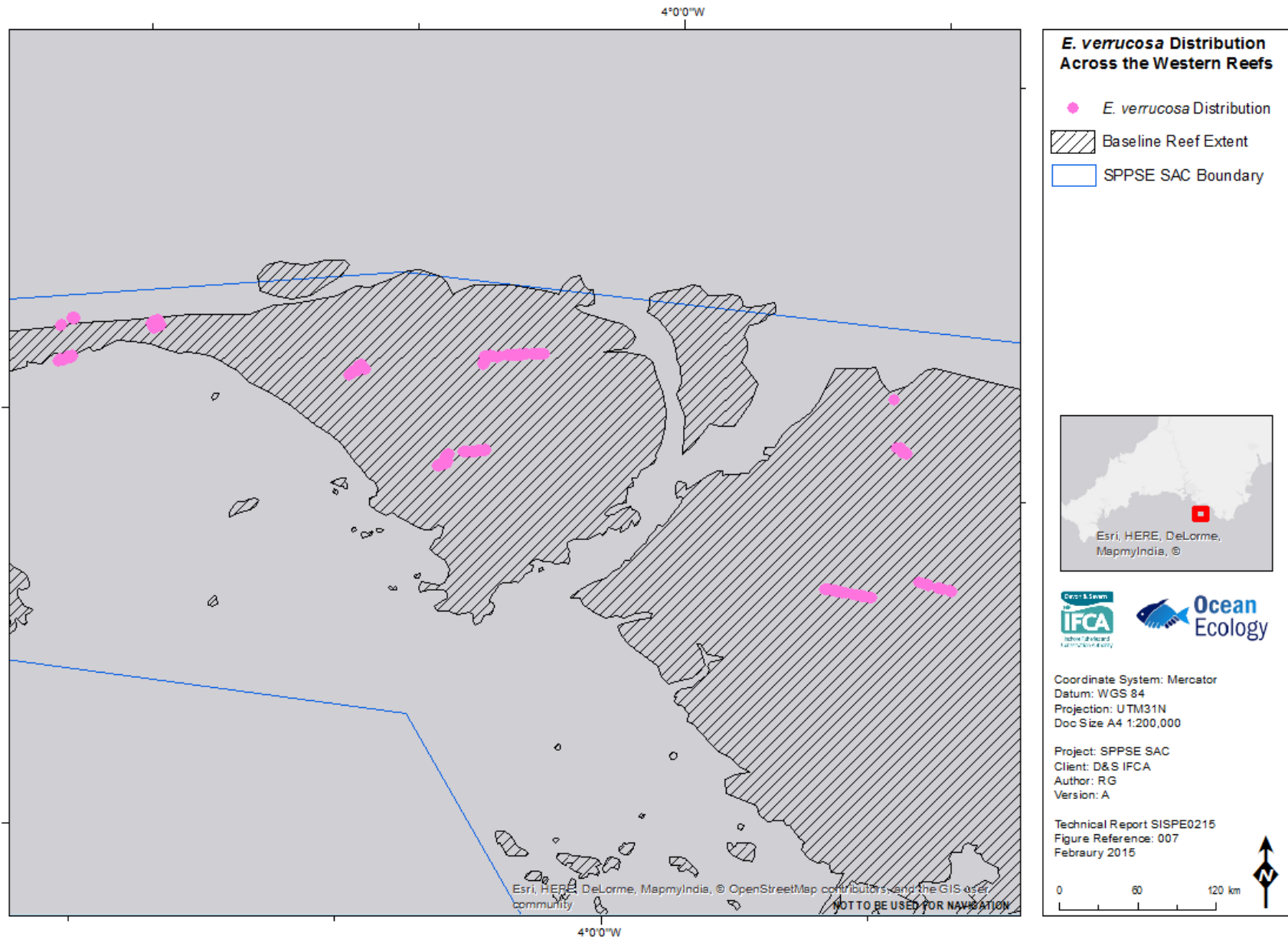
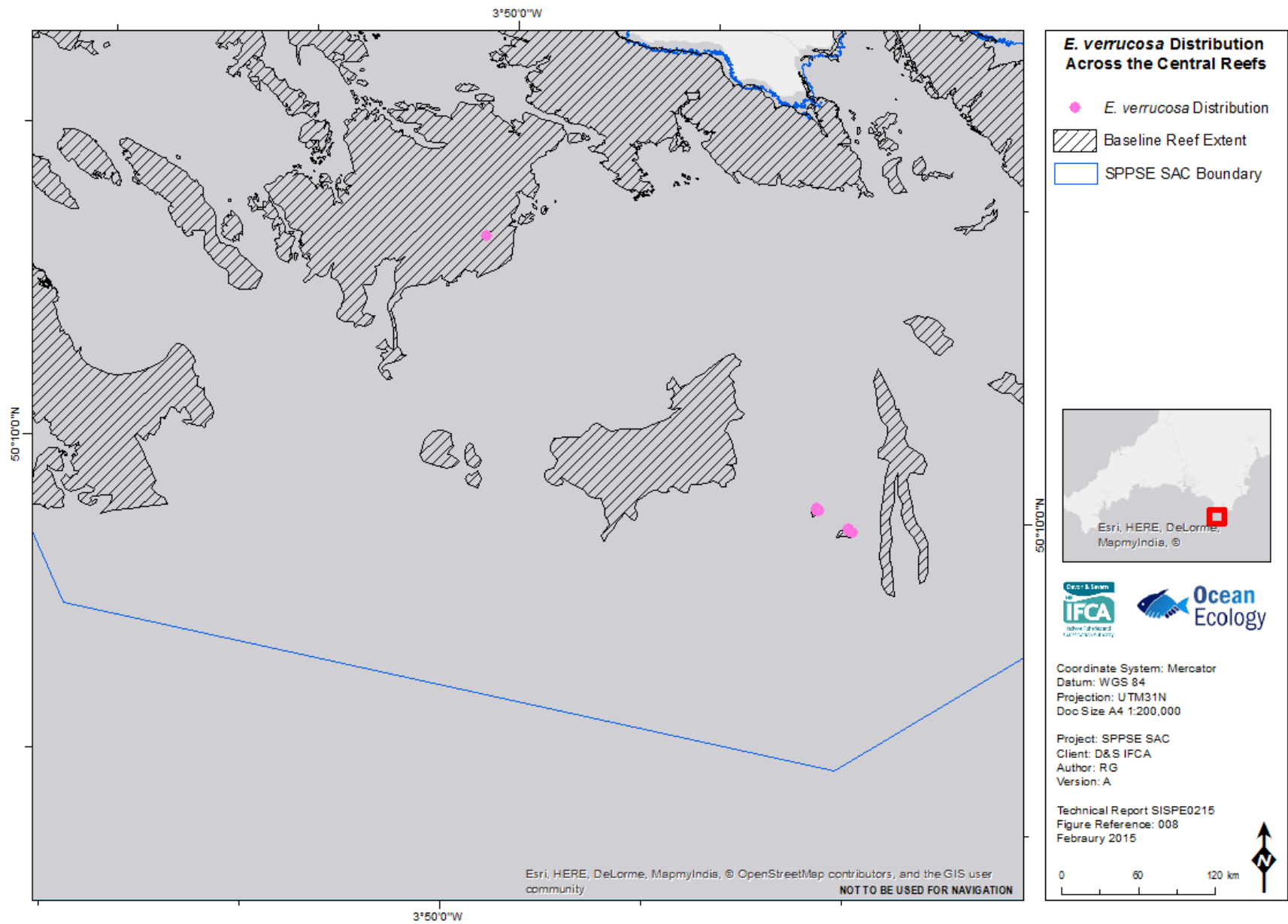
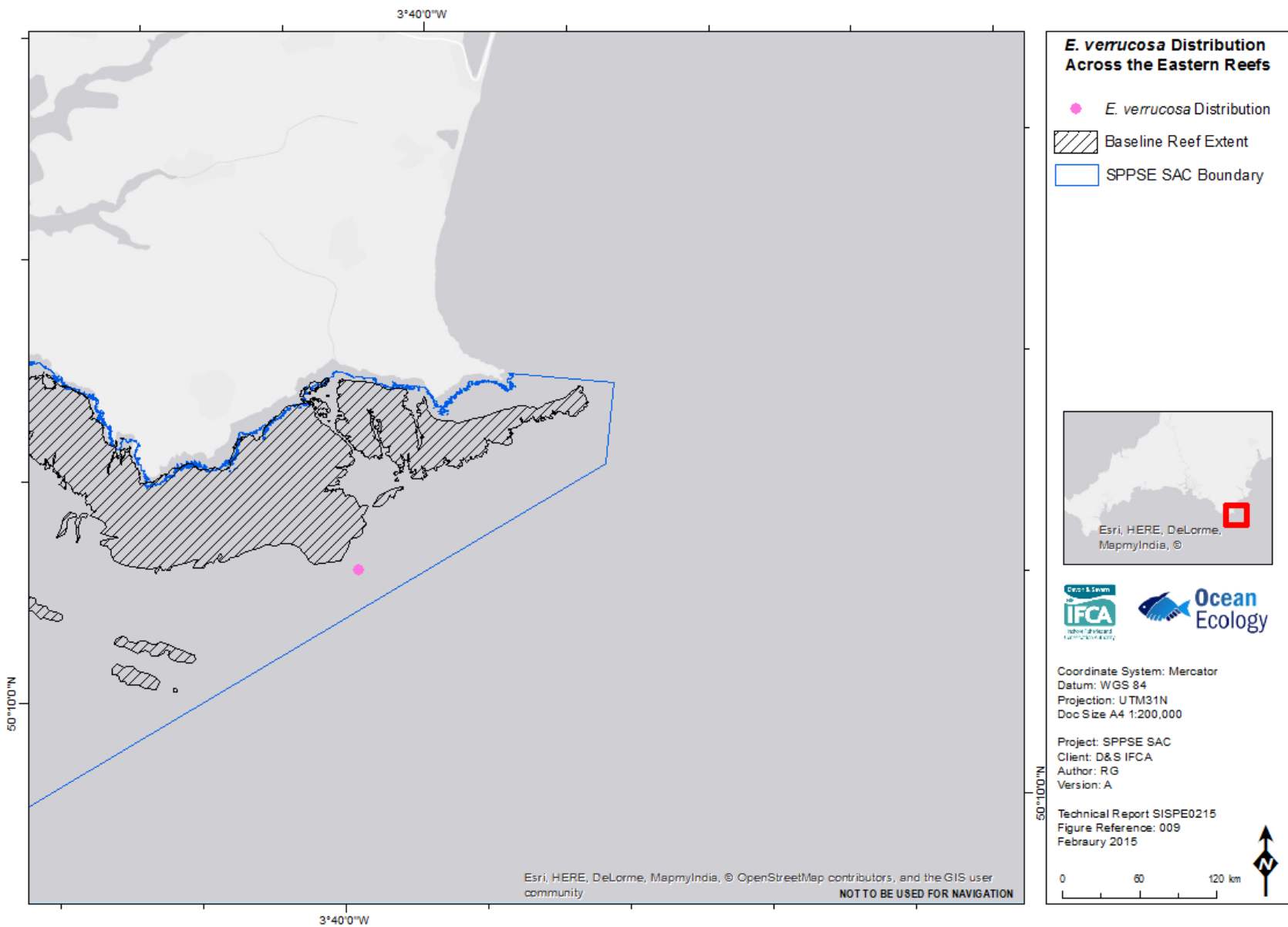


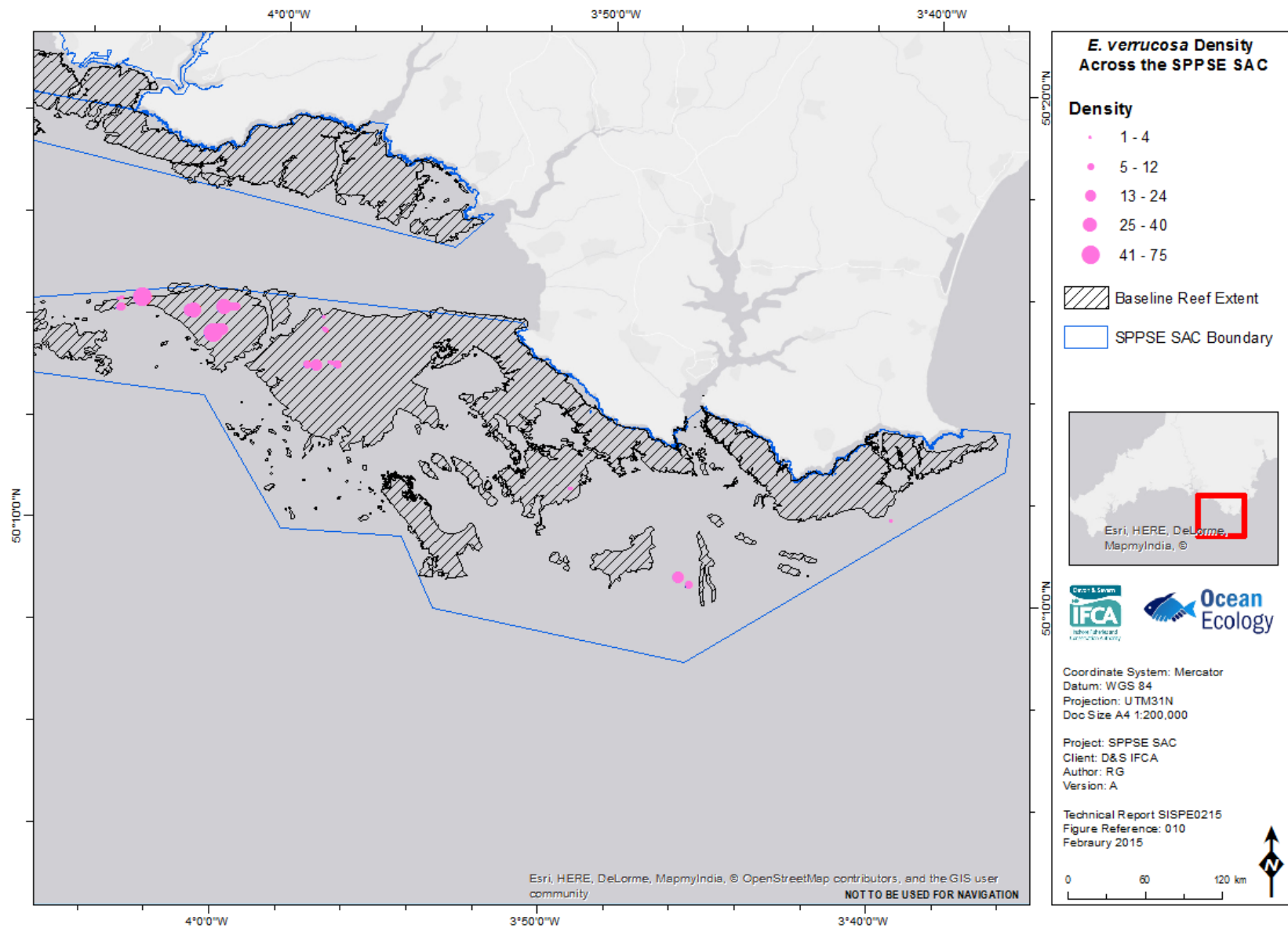
Figure 7. Map illustrating the occurrence of *E. verrucosa* along each of the video tows sampled across the Western Start Point to West Rutts Reefs.



**Figure 8.** Map illustrating the occurrence of *E. verrucosa* along each of the video tows sampled across the Central Start Point to West Rutts Reefs.



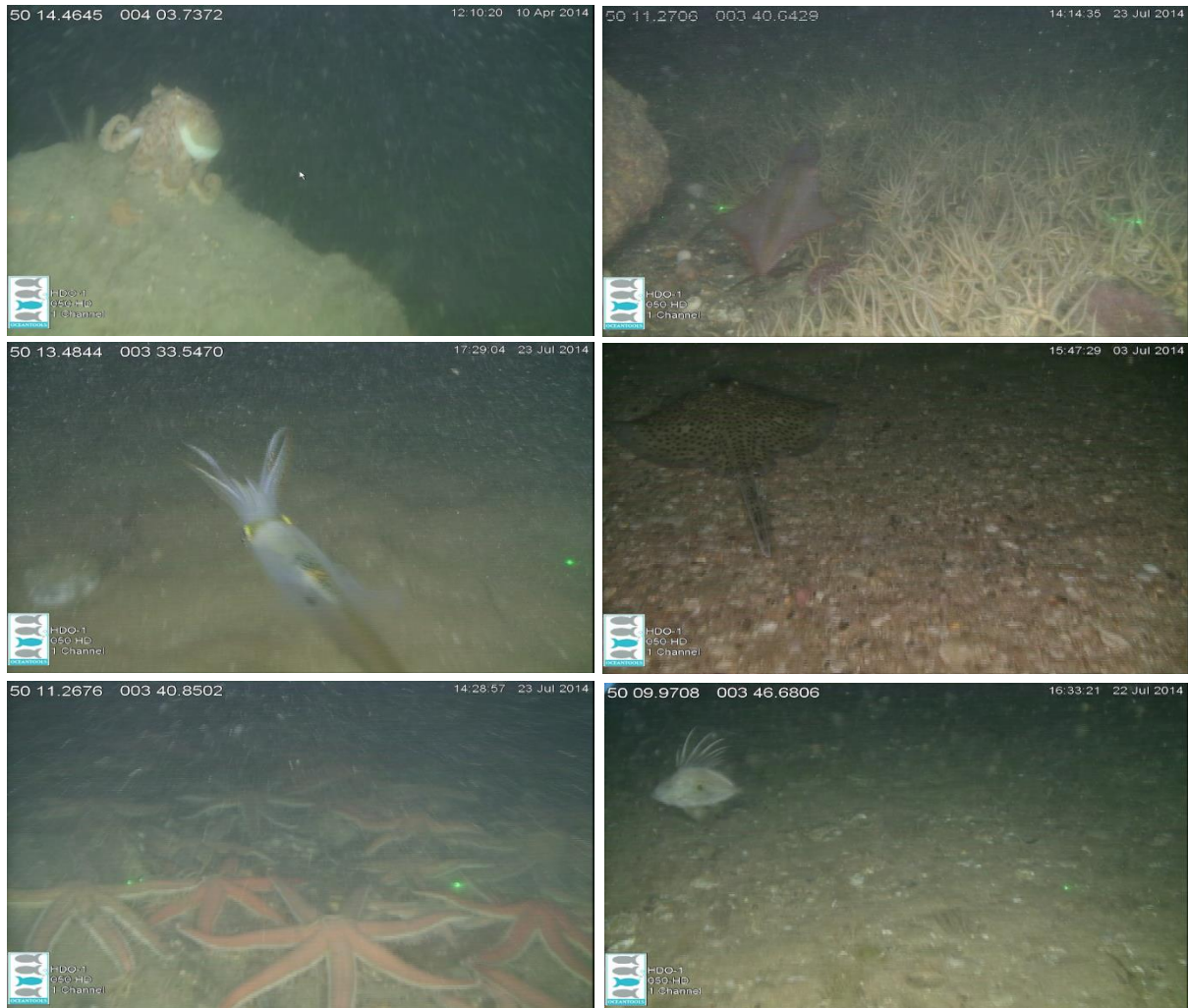
**Figure 9.** Map illustrating the occurrence of *E. verrucosa* along each of the video tows sampled across the Eastern Start Point to West Rutts Reefs.



**Figure 10.** Map illustrating the density of *E. verrucosa* along each of the video tows sampled across the SPPSE SAC.

### 3.5 Other Notable Species

A number of habitats and species of interest were noted during the analysis of the video footage (Plate 2) which included a number of cephalopods (Octopodidae, *Loligo* spp. and *Alloteuthis subulata*), spotted ray, *Raja montagui*, expanses of the seven armed starfish, *Luidia ciliaris*, on mixed sediments (thought to be feeding on the high density of brittle starts in the area (Brun, 1972)) and a John Dory, *Zeus faber*, swimming over mixed sediment.

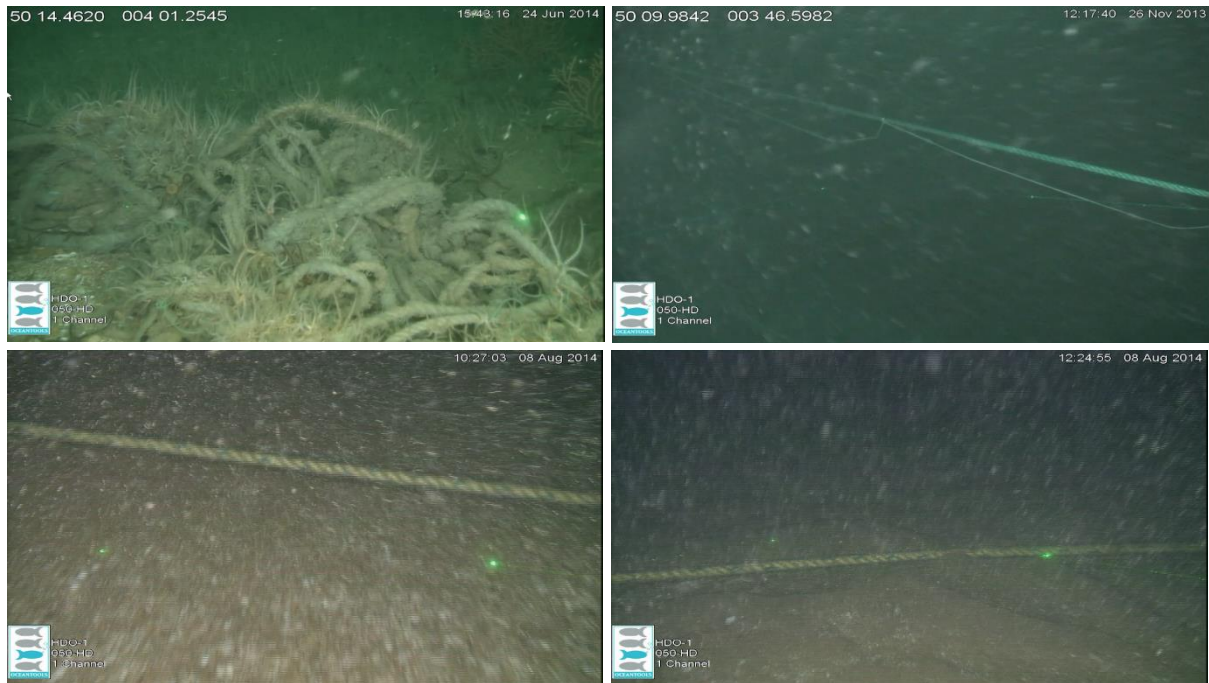


**Plate 2.** Notable species recorded during the analysis of video tows from the SPPSE SAC. Top left: an octopus of the family Octopodidae. Middle left: European common squid, *Alloteuthis subulata*. Bottom left: expanses of the seven armed star fish, *Luidia ciliaris*. Top right: a squid of the genus *Loligo* spp. swimming over a brittle star bed. Middle right: a spotted ray, *Raja montagui*, on coarse sediment. Bottom right: a John Dory, *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 (as described in Section 3.4). There were however a few observations of discarded and possibly 'active' fishing gear as shown in Plate 3.



**Plate 3.** Fishing gear noted in the video tow footage collection across the SPPSE SAC.

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