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Monitoring of Fal and Helford SAC 2011

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Executive Summary

This report describes the results from an interdisciplinary field survey aimed at assessing the status of Annex I habitat features in the Fal and Helford SAC. The habitat features of interest are: (i) Estuarine bedrock, boulder and cobble and (ii) Sub-tidal rock and boulder. Surveys were carried out in both the River Fal and Falmouth Bay during 10th-14th October 2011 to monitor the status of the features within the SAC in accordance with Regulation 35 of the Habitats Regulations.

Previous survey work in the River Fal indicated that the estuarine sub-features of interest (namely bedrock boulder and cobble) are present north of Turnaware Point and in the vicinity of Tom's Rock (Moore *et al*., 1999). Opportunistic sidescan sonar data, collected prior to the present survey by the Cornwall IFCA, supported the predicted presence and extent of the rock habitats within River Fal. These data were also fundamental for informing the planning and execution of the groundtruthing survey designed to provide a robust characterization of the physical habitat features and their associated algal and faunal communities. No previous records of the biotope A3.362/IR.LIR.IFaVS.CcasEle could be identified from previous studies within the survey areas and this biotope was not observed during the 2012 survey. Therefore, it was not possible to assess current status of this attribute as part of this study.

The sub-features of interest in Falmouth Bay (namely sub-tidal bedrock, boulders and cobble) had previously been identified adjacent to the coast in the south-west and north-east regions of Falmouth Bay along the 20-30m depth countour (Davies and Sotheran, 1995). Modelled bathymetric data (from the Astrium DEM model) were utilised to explore the predicted extent of the circalittoral rock features of interest and also informed the placement of groundtruthing stations to allow a robust characterisation of their associated faunal communities. Additionally, the existence of previously acquired video data (collected during the 1994 survey) for the features of interest in Falmouth Bay allowed any large scale changes over time in the high level biotope classifications to be explored. Comparisons were made between the 1994 and 2011 video (processed by the same post-processor using identical methods) acquired for these rock and boulder habitats. Results indicated that broadscale biotope classifications for these 'historical' stations had remained unchanged over the 17 year time period that had elapsed between the two surveys.

Recommendations are provided on possible alternatives for future monitoring of the area given the limitations of survey techniques within each habitat type. In particular, it is recommended that

acoustic surveys are carried out, prior to groundtruthing, to allow a more scientifically robust assessment of the extent and status of associated sub-features and their associated attributes.

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1 Background and Introduction

1.1 Fal and Helford: Habitat Summary

The Fal is a deep sided inlet (or ria) which comprises a deep central channel with extensive areas of shallow bank on either side. The Fal, Tresillian, Truro and Percuil rivers, along with Restronguet Creek, all feed into the inlet. The biogeographical zones identified in the SAC are largely influenced by the very slow tidal streams present in most areas, the deposition of fine sediments and the relative scarcity of sublittoral rock habitats (Moore et al., 1999). Falmouth Bay has previously been described as being predominantly sedimentary, comprising mainly dead maerl (intact pieces, crushed or biogenic maerl derived sand) (Davies and Sotheran, 1995, Howson et al., 2002). Rock biotopes have previously been identified adjacent to the coast in the south-west and north-east regions of Falmouth Bay along the 20-30m depth contour (Davies and Sotheran, 1995, Howson et al, 2002). The faunal communities present within the Fal and Helford SAC largely reflect the predominant features of the area in that a number of the communities in the ria are characterised by silt-tolerant species whilst those less silt-tolerant fauna are unable to penetrate very far upstream into the River Fal and its tributaries (Moore et al., 1999).

1.1.1 Littoral Rock

Littoral rock habitats have been identified in a number areas within the ria including St. Anthony Head (at the river mouth), the lower Percuil River and in Carrick Roads. Exposed bedrock in the region of St. Anthony head is characterised by typical open coast littoral communities comprising a variety of fucoid and red algae along with barnacles and the common limpet *Patella vulgata* along with sponge and bryozoan dominated communities at greater depths. Similar communities are characteristic of the infralittoral rock habitats of the Percuil River and Carrick Roads with species richness observed to decrease with increasing distance from the open sea (Moore et al., 1999).

1.1.2 Littoral Sediments

Sedimentary biotopes within the Fal estuary are reflective of the gradient in a number of physical parameters, namely salinity, turbidity, temperature and pollution. Species rich sheltered sand shores are typical of the fully marine environment at the mouth of the Fal. Muddy sediments upstream comprise communities which reflect the lower salinity levels (e.g., Nereid and Oligochaete annelids).

1.1.3 Sublittoral Biotopes

Shallow bedrock outcrops have been identified north of Turnaware Point and provides attachment for a number of algal species along with the sponges *Halichondria panacea* and *Hymeniacidon perleve*. The remainder of the sublittoral Fal is predominantly comprised of mixed sediments with bedrock and boulders present along the 20-30m depth contour in the west of the Bay which gives way to muddy shell gravel and cobble (Moore et al., 1999).

1.2 Fal and Helford SAC: Designated Features and monitoring

Specific habitats associated with estuaries and large shallow inlets and bays have been listed in Annex I of the European Habitats Directive as deserving special protection for conservation. The Fal and Helford SAC, situated on the south coast of Cornwall at the western entrance to the English Channel (Figure 1), contains representatives of a number of these features, namely 'subtidal rock and boulder communities' and 'estuarine bedrock, boulder and cobble communities'. In accordance with Regulation 35 of the Habitats Directive the designated features (and their attributes) within the SAC require monitoring over reporting cycles appropriate to the given feature. Monitoring, in this context, comprises an assessment of the extent and distribution of given features (and sub-features) and also the status (or condition) of their associated characteristic faunal communities (JNCC, 2004). Previous studies have acted to identify the presence, extent and status of a number of these features of interest, which underpin the SAC designation (Davies and Sotheran, 1995, Moore et al., 1999, Howson et al., 2002). Therefore, the 2011 survey was designed to allow an assessment of the current extent and condition of the sub-features of interest (and their attributes) to be evaluated in relation to the findings of previous monitoring.

1.3 Links to action plan

The Plan of Action (PoA) document listed a number of work packages to ensure the attainment of the projects objectives; these included:

1. *Develop a cost effective sampling design to enable a measure of each sub-feature to be obtained*
2. *To make an assessment of change for each attribute against a baseline where it exists. Where it does not, produce a baseline against which future measures can be assessed*
3. *To assess for any signs of human derived damage or disturbance*
4. *To report on any deficiencies of individual data collection methods or techniques*

1.4 Location map

The extents of the Fal and Helford SAC is shown below in Figure 1.

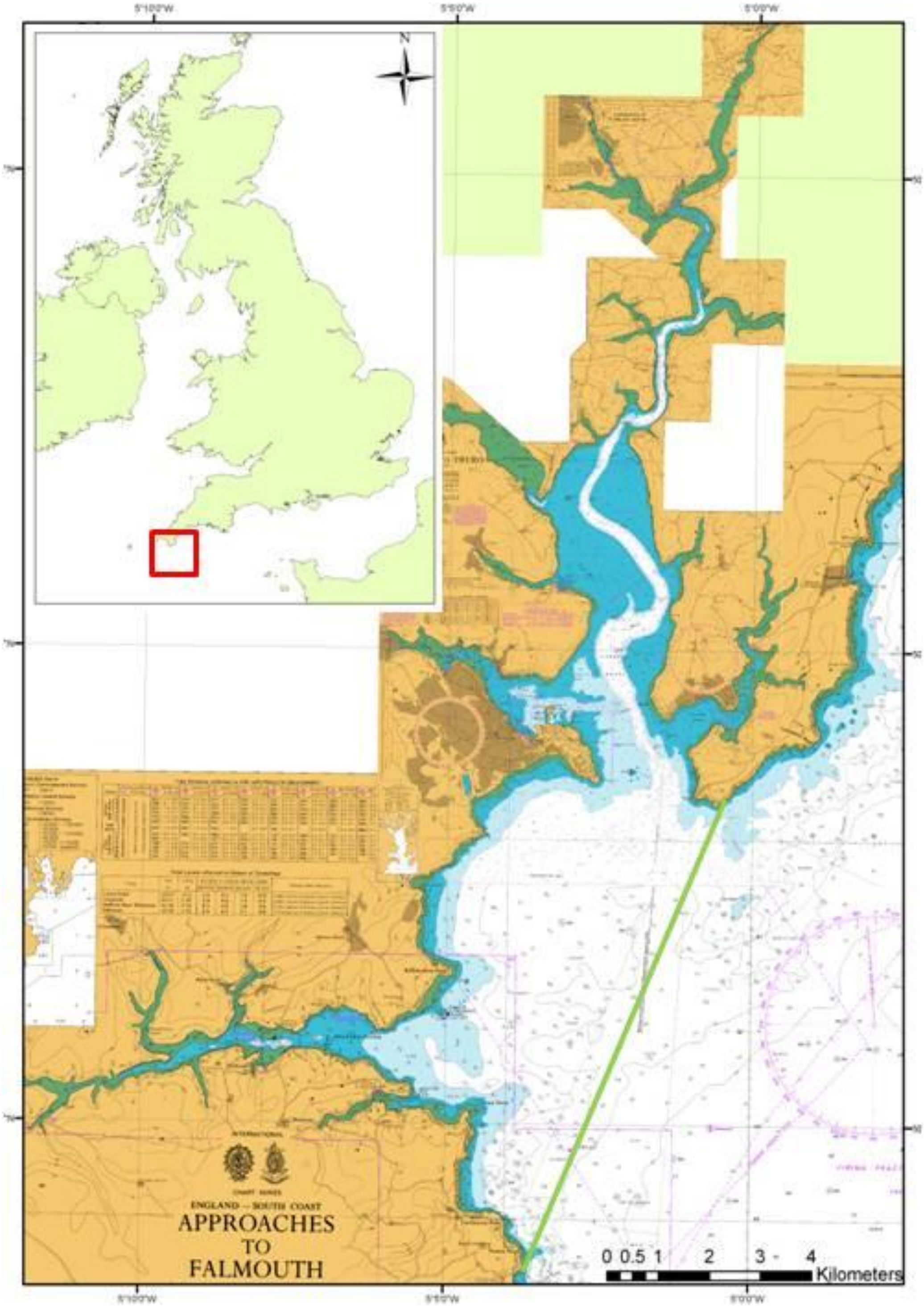

Figure 1. Fal and Helford SAC (offshore extent indicated by green boundary).

1.5 *Geological and Biological Context*

The sub-features of interest (and their associated attributes) within the Fal and Helford SAC for this survey are described below in Table 1.

Table 1. Description of attributes that require assessment in 2011 for the Fal and Helford SAC according to the Regulation 35 (formerly Regulation 33) package for the site. See Annexes 8.3 and 8.4 for full biotope descriptions.

Feature	Sub-Feature	Attribute	Measure and Target
Estuaries	Estuarine Bedrock, Boulder and Cobble Communities	Extent and distribution of characteristic biotopes: **A3.225/IR.MIR.KT.FilRVS** (previously LsacRS.FiR) **A3.362/IR.LIR.IFaVS.CcasEle** (previously SIR.Cor.Ele)	Extent and distribution of characteristic biotopes should not deviate significantly from an established baseline subject to natural change. *Measured during summer, once during reporting cycle.*
Large Shallow Inlet and Bay	Subtidal Rock and Boulder Communities	Species composition of characteristic biotope: **A4.1311/CR.HCR.XFa.ByErSp.Eun** (previously MCR.ErSEun) **A4.1313/CR.HCR.XFa.ByErSp.Sag** (previously ECR.AlcMas)	Presence and abundance of composite species should not deviate significantly from an established baseline subject to natural change. *Measured during summer, once during reporting cycle.*

Previous studies had identified that the sub-feature 'estuarine bedrock, boulder and cobble' was present in the River Fal, north of Turnaware point (Moore et al., 1999). Areas of the river upstream of King Harry passage were described as comprising steep littoral rock with areas of silted, horizontal rock supporting low densities of associated fauna. No previous records of the attribute A3.362/IR.LIR.IFaVS.CcasEle were identified from previous studies. It was, therefore, unclear as to why this attribute was identified for current assessment.

Sub-tidal boulder and rock communities had also been previously identified (and described) within the Falmouth Bay survey area (Davies and Sotheran, 1995, Howson et al., 2002). Extensive video and diver surveys carried out in 1994, 2001 and 2002 identified circalittoral rock, boulder and stones to be present in the inshore areas of Falmouth Bay which supported a rich faunal turf characterised by erect sponges and the pink sea fan *Eunicella verucosa* (A4.1311/CR.HCR.XFa.ByErSp.Eun).

2 Survey Design and Methods

2.1 Survey Project Team

The Fal and Helford SAC survey was carried out during 10th-14th October 2011. The Cornwall Inshore Fisheries and Conservation Authority (IFCA) Fishery Patrol Vessel 'Saint Piran' was used as a platform for the purpose of the survey (Figure 2). Biological expertise was provided by Dr. Sue Ware (Cefas) and technical expertise was provided by Mr Bill Meadows (Cefas) for the duration of the fieldwork.

Figure 2. Cornwall IFCA Fisheries Patrol Vessel 'Saint Piran'.

2.2 Planning: including site/station selection

2.2.1 Aims and Objectives

The aim of the surveys carried out within the Fal and Helford SAC were to assess the extent of the sub-features of interest and to characterise their associated biological communities in accordance with Regulation 35 (formerly Regulation 33) (JNCC, 2004). Particular attributes of interest were those which had previously been identified as being associated with the given sub-features, namely A3.225/IR.MIR.KT.FilRVS on the estuarine bedrock, boulder and cobble habitats and A4.1311/CR.HCR.XFa.ByErSp.Eun and A4.1313/CR.HCR.XFa.ByErSp.Sag on the subtidal rock and boulder habitats in Falmouth Bay. However, in addition to the attributes detailed above there are also requirements under Common Standards Monitoring (CSM) to characterise biotope composition of each sub-feature and describe their distribution and spatial pattern.

The survey was designed in such away that a robust characterisation of the 'data poor' sub-features could be achieved against which future monitoring data may be compared. Furthermore, where possible, the 2011 survey data was collected in such a way to allow comparisons to be made with existing data to inform the assessment of potential change in the extent and/or condition of the sub-features of interest.

2.2.2 Search Strategy and Methods

The adopted survey strategy comprised an array of new video and stills imaging sampling stations (where previous characterisation data were sparse or non-existent) along with a number of existing sampling stations which had been visited during previous video or diver surveys (particularly in Falmouth Bay which had been subject to a relatively high level of survey effort in the past) (Davies and Sotheran, 1995).

Existing acoustic data were sourced to assist in informing the survey design for the two survey areas within the Fal and Helford SAC. Sidescan sonar backscatter data (acquired by the Cornwall IFCA prior to the 2011 survey) were utilised to direct placement of the River Fal stations to areas predicted to contain the sub-features of interest. Similarly, the placement of survey stations in the Falmouth Bay area was informed by outputs of the Digital Elevation Model (DEM) (Astrium, 2011) to extend sampling into additional areas characterised by circalittoral rock and boulders with which the attributes of interest are known to be associated.

2.3 *Acoustic and geophysical methods*

2.3.1 River Fal

Placement of sampling stations in the River Fal survey area were informed by sidescan sonar data collected opportunistically by the Cornwall IFCA prior to the groundtruth survey commencing (Figure 3).

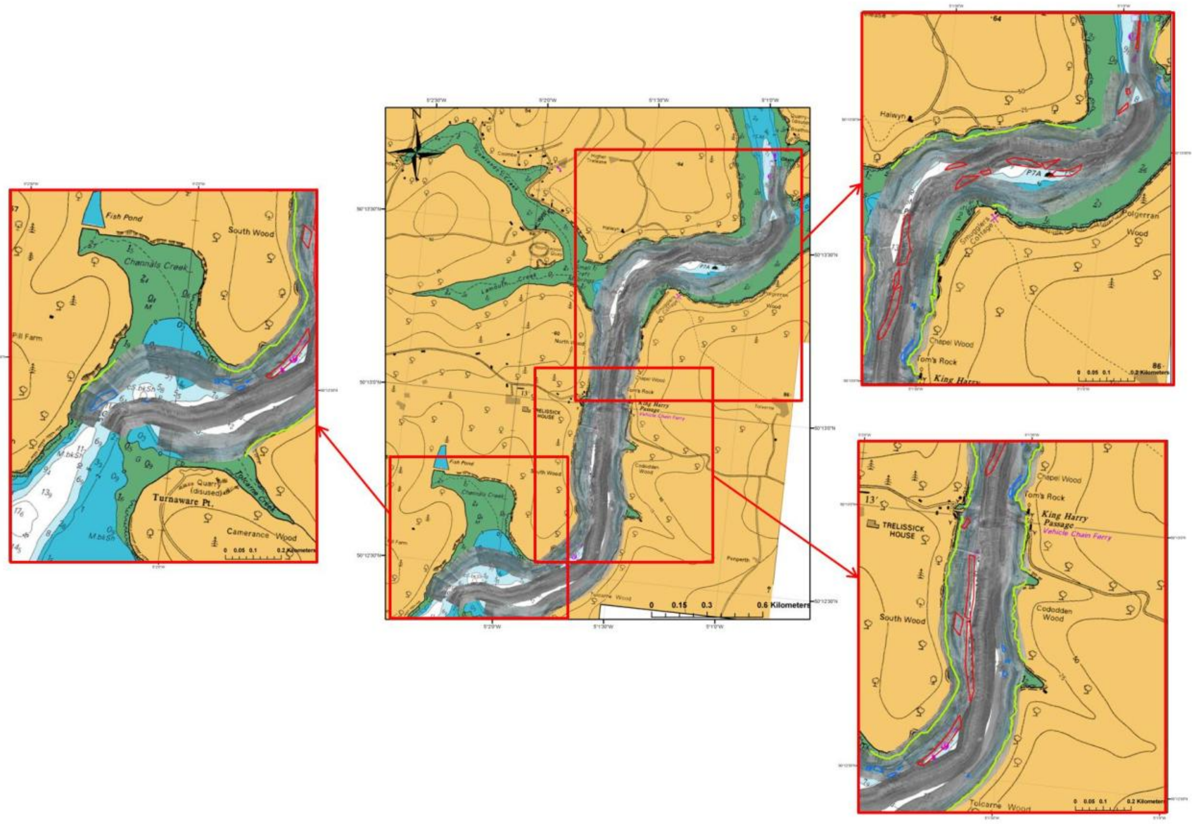

Figure 3. Interpreted acoustic sidescan sonar data. Red boundaries indicate moored vessels, green boundaries indicate the shoreline and blue boundaries indicate rock outcrops

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2.3.2 Falmouth Bay

The survey within the Falmouth Bay area was designed to allow a number of existing historic survey stations (Davies and Sotheran, 1995) to be re-visited. Additionally, outputs of the DEM (Astrium, 2011) were utilised to extend the sampling positions into areas where the sub-feature of interest (subtidal rock and boulders) were predicted to occur (Figure 4).

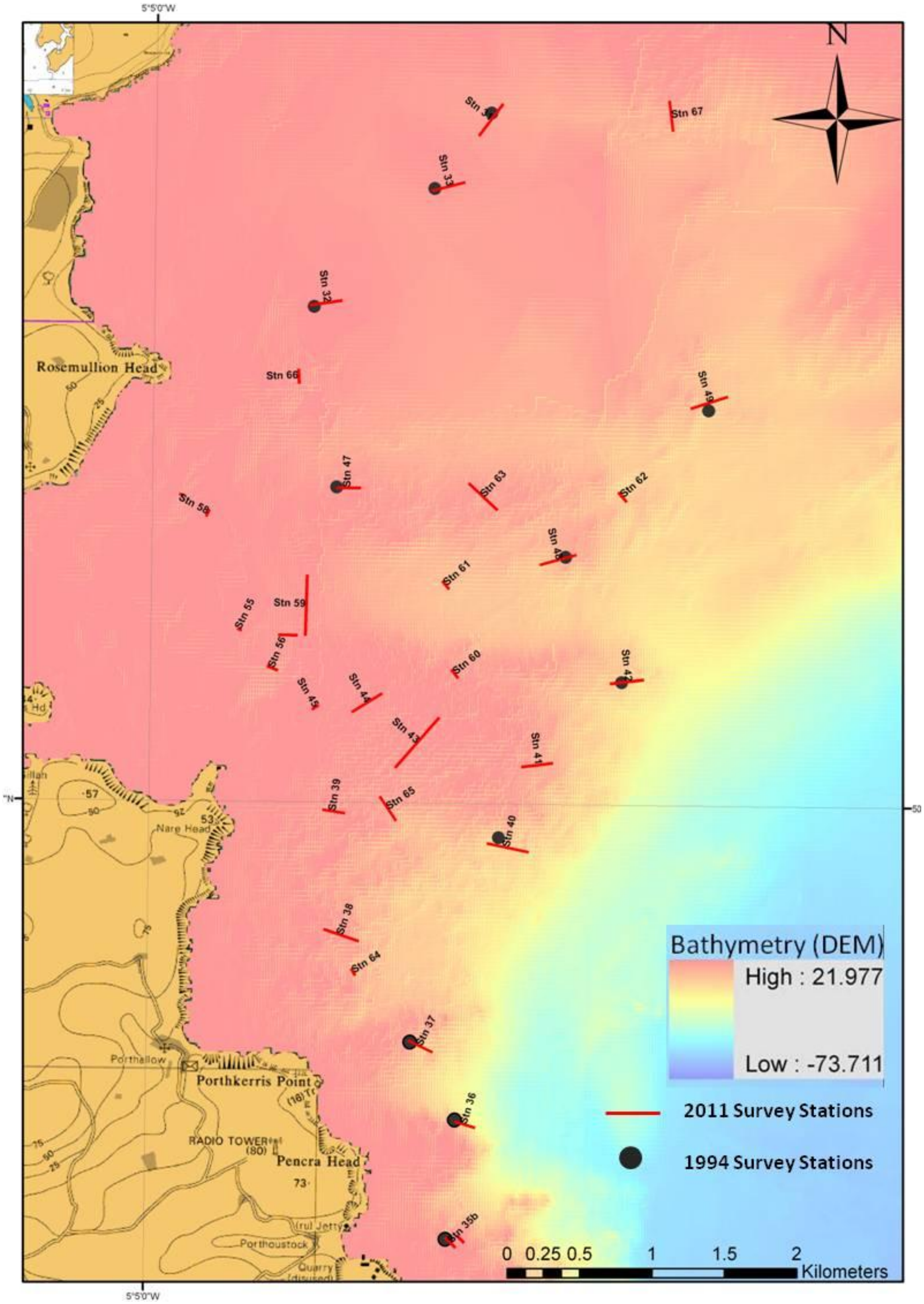


Figure 4. 2011 survey station positions in relation to historical survey stations (Davies and Sotheran, 1994). Circalittoral rock and boulder habitats were predicted to occur along the 20-30m depth shown using bathymetric outputs of the DEM (20-30m depth contour indicated by transition from pink to yellow) (Astrium, 2011).

2.4 Sampling methods (seabed imagery)

The survey employed a Kongsberg OE14-208 camera (video and stills) system, deployed using a mini-sledge configured as a drop camera frame (Figure 5).

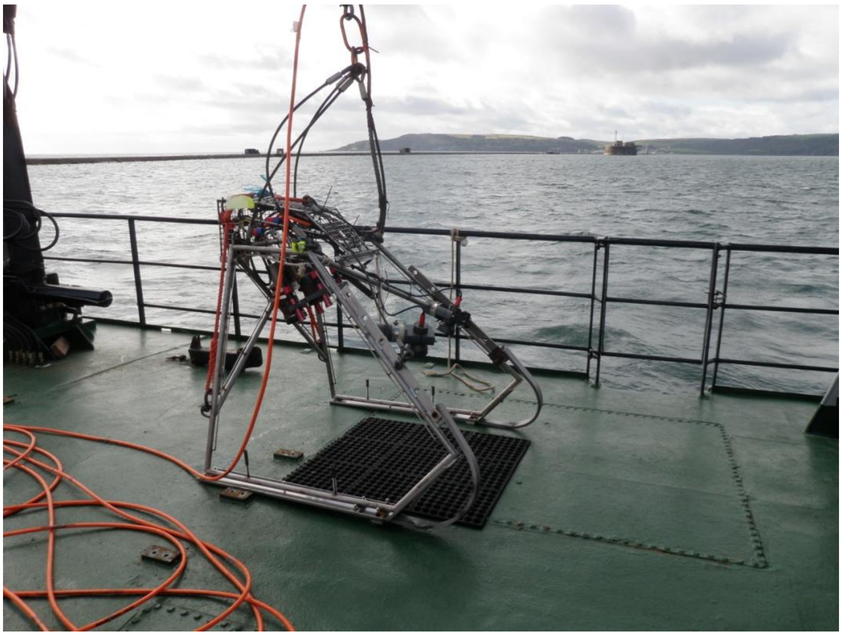


Figure 5. Drop camera frame with video and stills cameras and lighting configured according to MESH ROG.

The drop video camera and stills system was set up in accordance with the Common Standards Monitoring protocol, and in particular with the MESH guidelines 'Recommended Operating Guidelines (ROG)[1] for underwater video and photographic imaging techniques'. The camera was placed in the camera sledge along with two Cefas high intensity LED striplights. A Cefas quad laser rangefinder was aimed along the boresight of the camera to give reference dimensions on the seabed as the frame varied in altitude. Video was recorded on a Sony GV-HD700 in DV tape format. The video and stills were annotated with time and position using a GPS referenced video overlay from a Furuno GPS37 satellite receiver (differential corrections were obtained using the IALA differential service). The drop frame height was controlled via a winch operator in sight of the video feed.

On arrival at each site, the ship drifted through the station position in the most suitable direction as dictated by the tidal currents and wind conditions. The drop camera system was deployed from the port side crane and lowered into position just off the seabed. Once the camera was in position the ship moved across the survey station at a speed of 0.3-0.5 knots. A real-time video link was fed to: a) a monitor positioned in the dry laboratory (where scientists observed the footage in order to provide a summary of habitat types and dominant fauna present), and b) a monitor on deck viewable by the winch operator (to allow the camera to be lifted and lowered depending on the bathymetry). Video footage was acquired for the full length of each transect and still images were

[1] Reference URL: http://www.searchmesh.net/PDF/GMHM3_Video_ROG.pdf

taken at 1 minute intervals (plus additional ‘ad hoc’ points to capture particular features or fauna of interest).

Logsheets were populated for each station with the time, position and water depth at the start and end of each transect, along with a brief summary of the main habitat types and species present. Video footage was simultaneously recorded onto two Digital Video Tapes (DVT), and a media catalogue was populated to show which tape or disk contained the video footage acquired at each station. Still images were downloaded from the camera system at regular intervals and were stored and backed-up on two separate portable hard drives.

2.5 Sample processing/analysis methods

Each video tow was analysed by viewing several times, first to detect and record any changes in biotope across the entire transect, and second, to describe the physical features and quantify the epifaunal species characterising each biotope. Physical features recorded included the proportion of different substrate types, inclination, texture, stability and evidence of siltation. Epifauna were quantified according to the MNCR SACFOR abundance scale (S = Superabundant, A = Abundant, C = Common, F= Frequent, O = Occasional, R = Rare). A minimum of three photographic stills were analysed from each of the different biotopes identified in the video transect. Epifauna were also recorded using the SACFOR scale. All information extracted from the video and stills samples was recorded on the MNCR Habitat recording forms.

2.6 Data Analysis

Mulivariate analyses (using Primer v6) were applied to the SACFOR data derived from video and stills to explore spatial characteristics of the faunal assemblages identified. A Bray-Curtis similarity measure was applied to the species abundance data (using a linear numerical scale applied to the SACFOR scores). A Similarity Profile (SIMPROF) routine was then carried out to explore the faunal community patterns within the data and also to validate the level 5 EUNIS classifications applied as a result of video and still image processing.

2.7 Data QA/QC

Video and photographic stills were processed and results checked following the recommendations of the National Marine Biological Analytical Quality Control Scheme and those described in Ware and Kenny (2011).

3 Results and Data Analysis

3.1 Species abundance data, ID of key species, rarities etc.

Data extracted from video and still imagery are at best semi-quantitative. Therefore, there are limitations to what can be achieved through statistical data analysis. Detailed inspection of the video and still images identified a total of 87 mostly epifaunal taxa. The relative distribution of epifaunal taxa across the two survey areas is shown below in Figure 6.

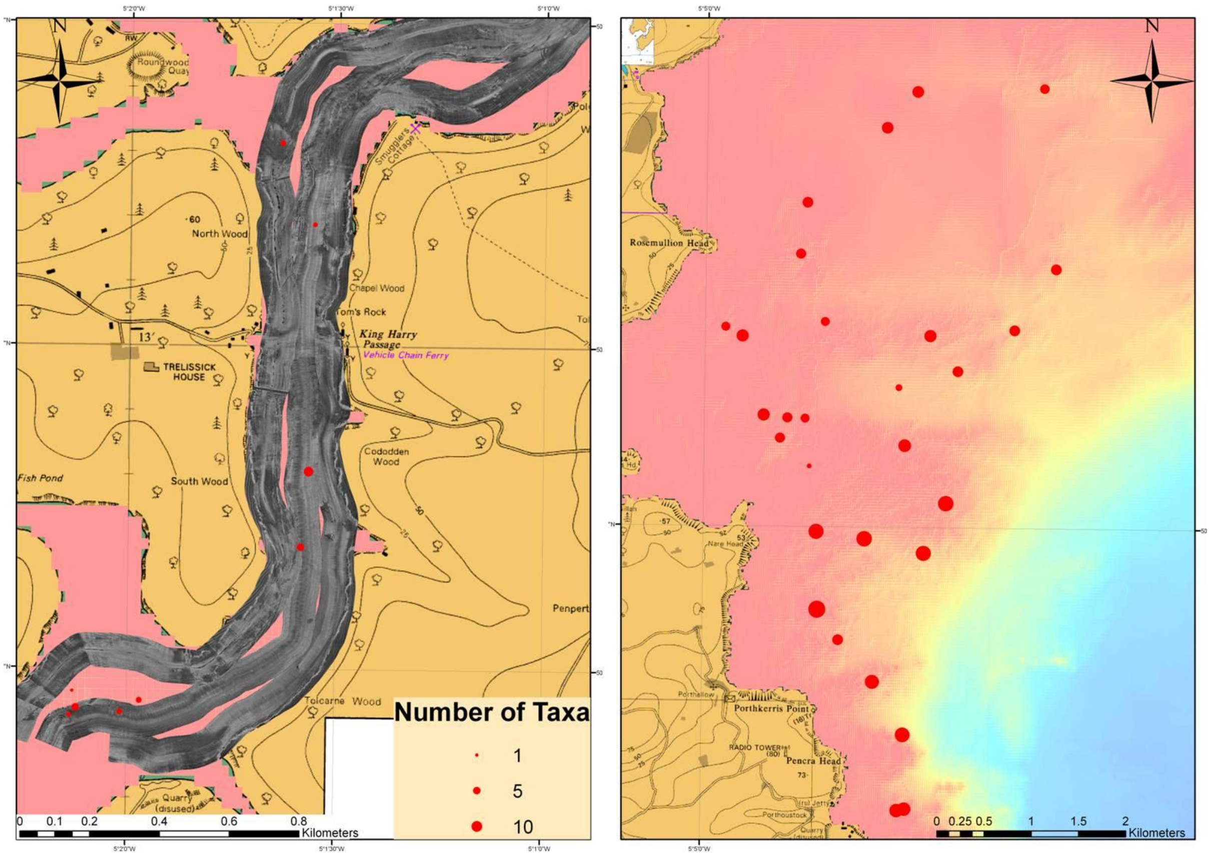


Figure 6. Relative distribution of the number of epifaunal taxa identified from video footage and still images at each sampling station.

While absolute values should be treated with caution, differences in the relative distribution of epifaunal taxa across the two survey areas are evident. Lowest numbers of taxa were observed in the video and still images obtained in the River Fal relative to those obtained in Falmouth Bay. Within the River Fal survey area, relatively higher numbers of taxa were found to be associated with rock biotopes. Similarly, within the Falmouth Bay survey area highest numbers of taxa were found to be associated with the circalittoral rock habitats present along the 20-30m depth contour as indicated by the transition from pink to yellow in the DEM bathymetry data (Figure 6, right).

3.2 Biotope Classifications

A number of biotopes were identified to be present at stations located across the River Fal and Flamouth Bay survey areas (Table 2, Figure 7 and Figure 8).

Table 2. Biotopes identified to be present at the stations surveyed in the River fal and Falmouth Bay. Attributes targeted for assessment during the 2011 monitoring are shown in bold.

Biotope	EUNIS	MNCR
Foliose red seaweeds on exposed lower infralittoral rock	A3.116	IR.HIR.KFaR.FoR
L. saccharina and/or *S. polyschides* on exposed infralittoral rock	A3.122	IR.HIR.Ksed.LsacSac
Dense *Desmarestia* sp. with red seaweeds on exposed infralittoral cobble, pebble and bedrock	A3.124	IR.HIR.Ksed.DesFilR
Mixed kelps with scour tolerant red seaweeds on scoured or sand covered infralittoral rock	A3.125	IR.HIR.Ksed.XKScrR
Halidrys and mixed kelps on tide swept infralittoral rock with coarse sediment	A3.126	IR.HIR.Ksed.XKHal
Kelp and red seaweeds on moderate energy infrlittoral rock	A3.21	IR.MIR.KR
Dense foliose red seaweeds on moderately exposed infralittoral rock	A3.215	IR.MIR.KR.XFoR
L. saccharina and *L. digitata* on sheltered sublittoral fringe rock	A3.3131	IR.LIR.K.Lsac.Ldig
Faunal communities on variable or reduced salinity infralittoral rock	A3.36	IR.LIR.IFaVS
Mixed faunal turf communities on circalittoral rock	A4.13	CR.HCR.XFa
***E. verrucosa* and *P. fascialis* on wave exposed circalittoral rock**	**A4.1311**	**CR.HCR.XFa.ByErSp.Eun**
Sublittoral sand	A5.2	SS.Ssa
Sublittoral sand in variable salinity	A5.22	SS.Ssa.SSaVS
Sublittoral mixed sediment	A5.4	SS.SMx
Sublittoral mixed sediment in variable salinity	A5.42	SS.SMx.SMxVS
O.fragilis and *O.nigra* on sublittoral mixed sediments	A5.445	SS.SMx.CMx.OphMx
Red seaweeds and kelps on tide swept mobile infralittoral cobbles and pebbles	A5.5211	SS.SMp.KSwSS.LsacR.CbPb

3.2.1 River Fal

The sub-features of interest (namely subtidal rock and boulder) were identified in the River Fal in the vicinity of Tom's Rock and North of Turnaware Point (Figure 7). Surrounding areas comprised mixed sediments and sand in variable salinity (A5.42 and A5.22 respectively).

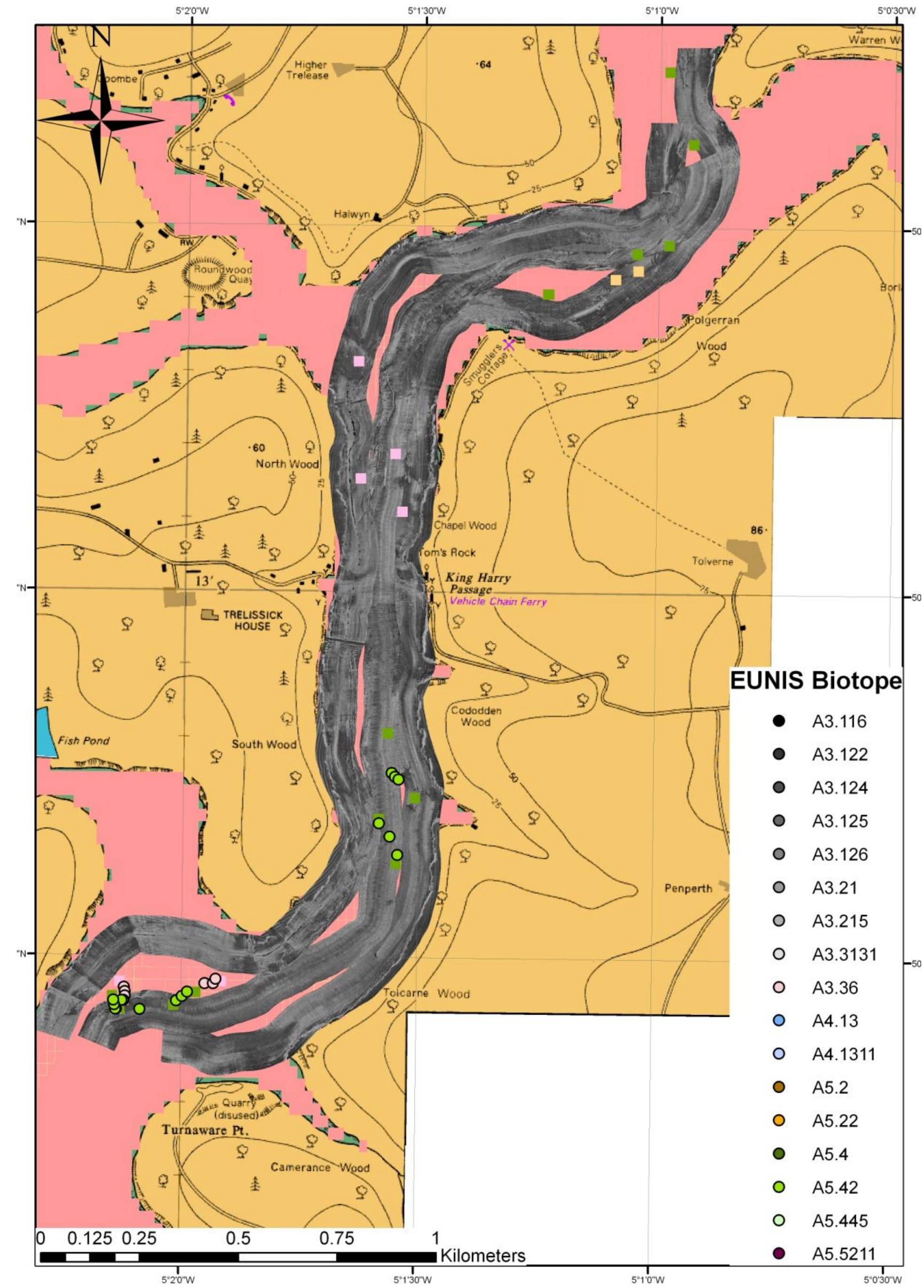


Figure 7. River Fal: Video start and end positions (depicted by square symbols) and still image positions (depicted by circle symbols) with points coloured according to their assigned EUNIS biotope classification (for equivalent MNCR biotope descriptions see Appendices 8.3 and 8.4).

3.2.2 Falmouth Bay

The 20-30m depth contour within Falmouth Bay (indicated by the transition from pink to yellow in the Astrium DEM) largely comprised wave exposed circalittoral rock colonised by the pink sea fan *Eunicella verucosa* and ross coral *Pentapora fascialis* (A4.1311/CR.HCR.XFa.ByErSp.Eun) (Figure 8). The shallower depth contours, further inshore, comprised infralittoral rock and boulders supporting a variety of diverse algal communities, interspersed by patches of mixed sediments and sand (Figure 8).

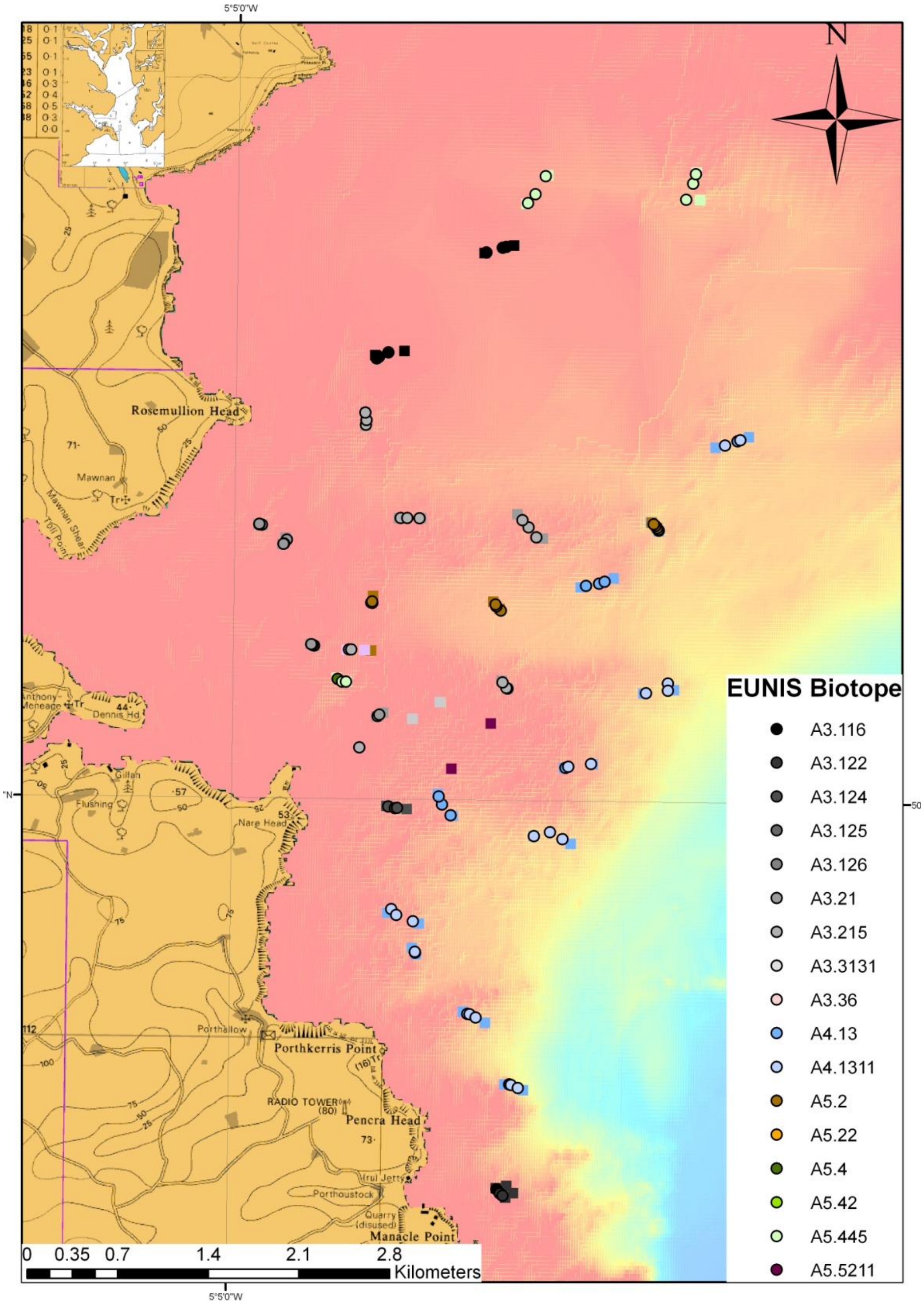


Figure 8. Falmouth Bay: Video start and end positions (depicted by square symbols) and still image positions (depicted by circle symbols) with points coloured according to their assigned Eunis biotope classification.

3.3 Faunal Community Characteristics

Patterns in epifaunal community characteristics across the survey areas were explored using multivariate statistical techniques. SIMPROF analysis identified that the video and still images collected could be delineated across 15 distinct groupings or clusters based on their characterising species. The species assemblages which largely contributed to the similarity within each SIMPROF group were explored using SIMPER analysis. These were then cross referenced against the biotopes assigned during video and still image processing (Figure 9). This acted to validate the assigned level 5 biotope classifications in relation to the species assemblages which were identified as being responsible for contributing to the similarity within the groups.

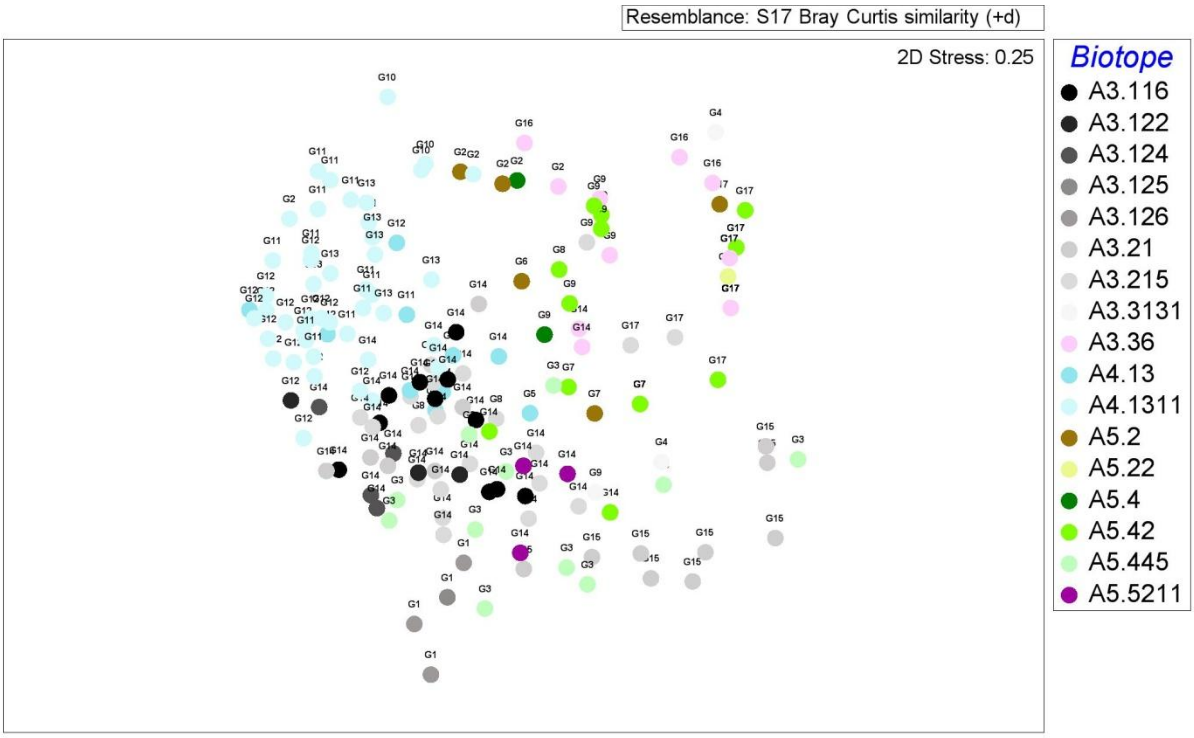


Figure 9. Graphical results from multivariate analysis of epifaunal data (SACFOR) extracted from video footage and still photographs. MDS plot illustrating the relative similarity between sampling sites, each represented according to the group number (G1-G17) assigned by a SIMPROF routine; each number denotes a statistically different assemblage. Symbols denote the assigned EUNIS biotope classification for given samples.

Table 3. Average similarity contribution of each taxon to the distinct assemblage in which it s found. Distinct assemblages identified by a SIMPROF routine on SACFOR data extracted from video and stills. Colours reflect relative within cluster similarity (Red=High, Green=Low).

	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17
Marthasterias glacialis			3.34		-	-		22.64	51.55	11.11		5.6	8.92	2.77			
Pomatoceros sp.			9.12		-	-	80.96				2.76	1.1		6.98			
U. hydroid turf		24.4			-	-					15.04	5.45	12.94	4.18			
Eunicella verrucosa					-	-				33.33	11.91	4.59	2.08				
Laminaria sp.					-	-								0.1	46.23		
Laminaria digitata				45.45	-	-											
U. red algae_foliose	8.65				-	-		15.09			0.81	1.24	2.22	8.48			
Alcyonium digitatum					-	-				16.57	3.36	5.56	0.39	0.02			
U. red algae_encrusting	6.27		3.85		-	-		2.3			0.66	1.77		6.44	1.12		0.3
Ophiocomina nigra			21.95		-	-											
Pentapora fascialis		1			-	-					1.47	3.95	14.15	0.04			
U. sponge_cushion			0.29		-	-		2.3			2.48	4.03	6.27	2.4	0.17		
U. bryozoan_encrusting	2.09				-	-									15.7		
Nemertesia antennina					-	-						2.37				14.81	
Cirripedia					-	-			0.69							4.76	11.19
Ophiothrix fragilis			16.48		-	-											
U. sponge_encrusting					-	-										16.34	
Caryophyllia smithii					-	-					12.89	0.71					
Laminaria saccharina	10.46				-	-		2.78						0.03			
U. red algae_filamentous			0.94		-	-						0.32		4.52	4.07		
Holothuria forskali					-	-					0.2	8.16		0.13			
Dilsea carnosa	4.53		0.11		-	-		2.3				0.3		0.09			
Echinus esculentus					-	-					0.13	5.52		0.34			
Ctenolabrus rupestris					-	-						0.43	2.52	0.15			
Halidrys siliquosa	2.61				-	-											
U. sponge_cushion					-	-				2.02							
Asterias rubens	1.33		0.57		-	-											
Suberites sp.		1.67			-	-											
Ulva lactuca	1.28				-	-								0.04	0.17		
Cryptopleura ramosa	1.28				-	-								0.18			
Dictyota dichotoma		1.33			-	-								0.01			
Botryllus schlosseri	1.17				-	-											
Nemertesia sp.					-	-					1.03						
Luidia ciliaris					-	-					0.17	0.6					
Obelia sp.	0.64				-	-											
Cliona celata					-	-			0.43			0.1					
U. sponge_cushion					-	-						0.03	0.39	0.06			
Stelligera stuposa					-	-					0.13	0.29					
Gibbula cineraria					-	-									0.26		
Pagurus prideaux			0.13		-	-											
Nemertesia ramosa					-	-						0.1					
Labrus mixtus					-	-						0.07					
Alcyonidium diaphanum					-	-						0.05					
Microciona sp.					-	-					0.04	0.01					
Halichondria bowerbanki					-	-						0.03					
U. anemone					-	-						0.03					
Desmarestia aculeata					-	-								0.02			
Homaxinella subdola					-	-						0.02					
Dendrodoa grossularia					-	-						0.01					
Paguridae					-	-								0.01			
Polymastia sp.					-	-						0.01					
Raspalia sp.					-	-						0.01					
Sabella sp.					-	-								0.01			
U. brown algae					-	-						0.01					
U. sponge_arborescent					-	-						0.01					
Total number of taxa	16	18	19	4	-	-	5	12	11	6	29	56	20	59	10	6	6
No. contributing to similarity	11	4	10	1	-	-	1	6	3	4	15	32	9	22	7	3	2
Average Similarity	40.32	28.4	56.79	45.45			80.96	47.4	52.67	63.03	53.09	52.48	49.87	37.03	67.73	35.91	11.49

3.3.1 River Fal

Stations within the River Fal (assigned to the biotope A5.36: 'faunal communities on variable or reduced salinity infralittoral rock') fell into the SIMPROF groups G9, G16 and G17. SIMPER analyses indicated that the rock habitats supported communities characterised by encrusting and cushion sponges (including *Cliona celata*), barnacles and a number of hydroid species (including *Nemertesia antennina*). The spiny starfish *Marthasterias glacialis* was also frequently found to be associated with the rock habitats in the River Fal.

The stations located in the mixed sedimentary habitats in the River Fal largely fell into the SIMPROF groups G8, G9 and G17. SIMPER analyses indicated that these habitats were characterised by a number of algal species, namely the kelp *Laminaria saccharina* and the foliose red algae *Dilsea carnosa*, along with encrusting sponges and hydroids.

The absence of the attribute IR.MIR.KT.FilRVS from the biotopes identified during the 2012 survey should not be interpreted as a change in the status of this feature within the survey area. Instead, it's absence from the range of biotopes identified is more likely a result of inaccessibility to the areas where it had previously been identified (namely the shallow water areas in the vicinity of Tom's Rock).

3.3.2 Falmouth Bay

The circalittoral rock habitats along the 20-30m depth contour in Falmouth bay were largely assigned to the biotope A4.1311/CR.HCR.XFa.ByErSp.Eun '*Eunicella verrucosa* and *Pentapora fascialis* on wave exposed circalittoral rock'. Stations assigned to this biotope largely fell into SIMPROF groups G10-G13 which were characterised by a number of attached epifaunal species, including a number of encrusting and cushion sponges, the bryozoan *Pentapora fascialis*, the soft coral *Alcyonium digitatum,* the Devonshire cup coral *Carophyllia smithii*, the pink sea fan *Eunicella verrucosa* and a number of hydroid species including *Nemertesia* spp. Mobile species characteristic of this biotope included the echinoderms *Marthasterias glacialis*, *Echinus esculentus* and *Holothuria forskali*.

The survey stations located in the shallower, more inshore waters largely fell into the biotope classifications 'exposed lower infralittoral rock' (A3.116/IR.HIR.KFaR.FoR, A3.122/IR.HIR.Ksed.LsacSac and A3.124/ IR.HIR.Ksed.DesFilR) which were largely associated with SIMPROF group G14. SIMPER analyses indicated that a number of algal species typically contributed to the observed similarity within this group and they included the kelp *Laminaria saccharina*, encrusting and foliose red algae (*Dilsea carnosa*, *Cryptopleaura ramosa*) and the sea lettuce *Ulva lactuca*. The more sheltered, moderate energy infralittoral rock areas (A3.21/IR.MIR.KR, A3.215/IR.MIR.KR.XFoR and A3.3131/IR.LIR.K.Lsac.Ldig) fell into SIMPROF groups 1, 8, 9 and 15 and were found to be similarly characterised by a variety of algal species including *Laminaria* spp., red foliose algae and the filamentous brown algae *Halidrys siliquosa*. Additional species which distinguished these less exposed infralittoral rock areas from the higher energy sites included the colonial ascidian *Botryllus schlosseri* and the common starfish *Asterias rubens*.

The mixed sediment and sand habitats interspersed between the rock outcrops largely fell into SIMPROF group G3 with associated characteristic epifauna including the brittlestars *Ophiothrix fragilis* and *Ophiocomina nigra*, common starfish *Asterias rubens* and the hermit crab *Pagurus bernhardus*.

One of the attributes identified for assessment (A4.1313/CR.HCR.XFa.ByErSp.Sag) was not identified during the 2012 survey. However, this should not be interpreted as a change in the status of this attribute but is instead more likely an artefact of the survey techniques employed (namely video and still imagery) and the inability to identify the characteristic (yet cryptic) species *Sagartia elegans* from images alone.

3.4 Comparison of circalittoral rock habitats surveyed in 1994 and 2011

A number of the stations from the 1994 survey (Davies and Sotheran, 1995) were revisited during the 2011 survey. This allowed the video footage acquired in 1994 to be compared with that obtained during the 2011 survey. Biotopes were assigned to the 1994 survey stations using the same image processing methods as those employed for the 2011 video data. Whilst comparisons were largely subjective (due to differences in the configuration of the video camera systems between years) it still proved a useful exercise in assessing whether the broadscale biotope classifications had remained the same over the 17 year period between the surveys.

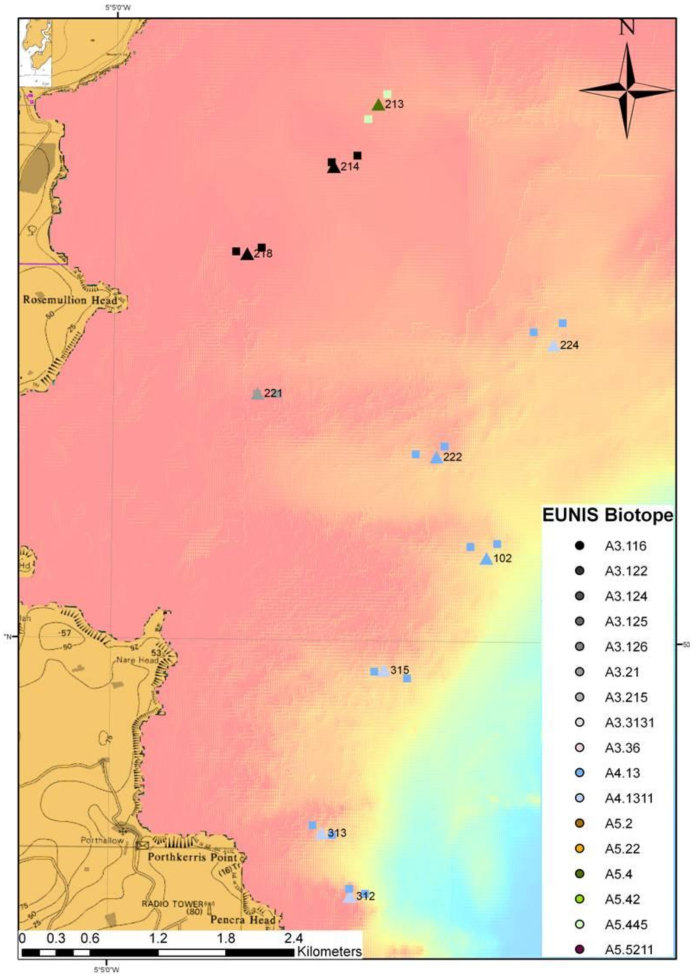
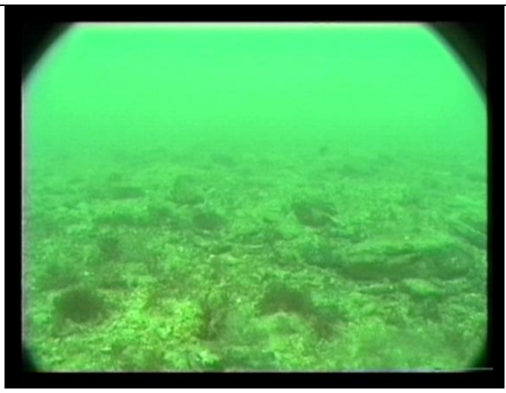
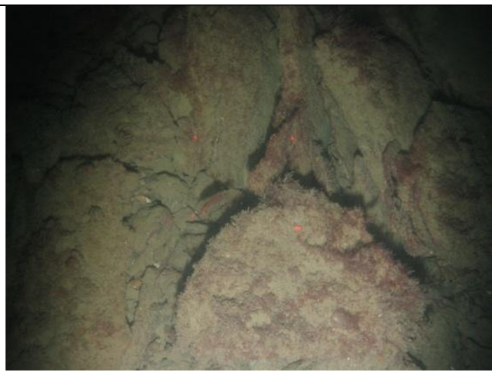
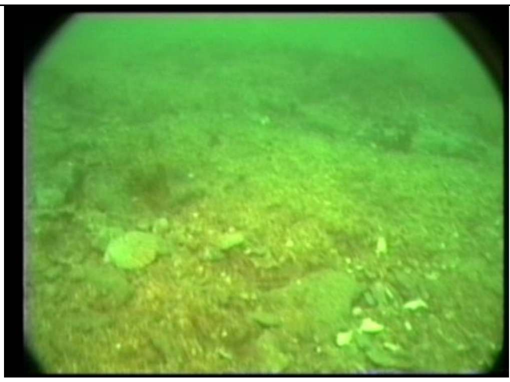
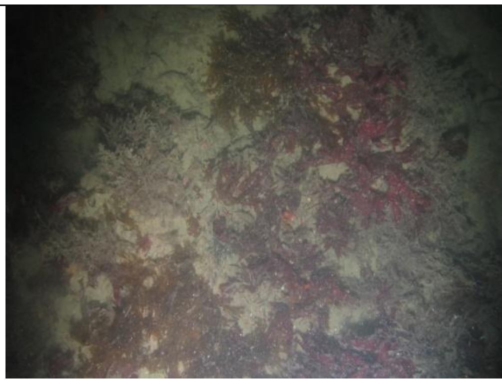


Figure 10. Biotope classifications assigned to the 2011 video data (indicated by square symbols) and 1994 video data (indicated by triangular symbols).

The biotope classifications for the comparative stations remain relatively consistent over the two survey periods with the only differences being two of the 2011 stations being assigned a more precise level 5 EUNIS classification (A4.1311/CR.HCR.XFa.ByErSp.Eun) within the same overarching broadscale classification identified in for the same stations in 1994 (A4.13/ CR.HCR.XFa)(Figure 10).

Comparison of images for given stations sampled during the different time periods indicate a similar faunal assemblage present during the two survey periods (Table 4). Observed differences in contrast between the two sets of images are believed to be due to different lighting systems employed for the two surveys.

Table 4. Images taken for comparative survey stations during the 1994 survey (left) and the 2011 survey (right).

Station	1994	2011
102		
214		
218		
221		

Station	1994	2011
222		
224		
312		
313		

Station	1994	2011
315		

3.5 *Example stills for biotopes identified*

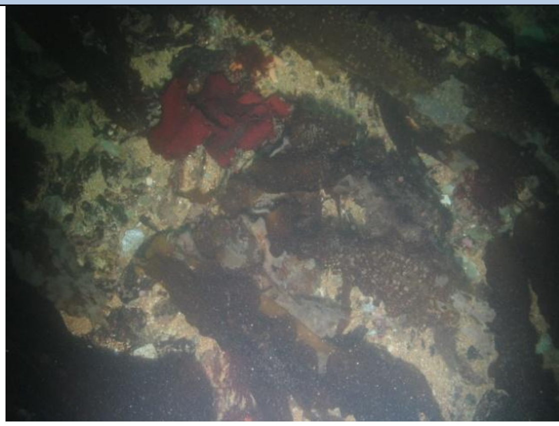
3.5.1 *River Fal*

Table 5. Example stills for biotopes identified in the River Fal.

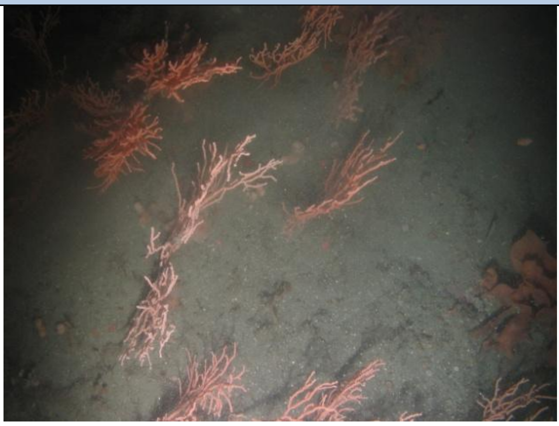
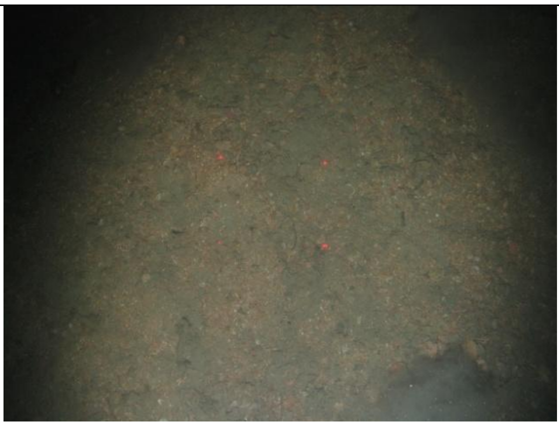
MNCR Biotope	Eunis Code	
Faunal communities on variable or reduced salinity infralittoral rock (IR.LIR.IFaVS) **Description** **Shallow subtidal rocky habitats which support faunal-dominated communities, with seaweed communities only poorly developed or absent.** **Species Observed** ***Halichondria* sp., *Marthasterias glacialis***	**A3.36**	
Sublittoral mixed sediments in variable salinity (SS.SMx.SMxVS) **Description** **Shallow sublittoral mixed sediments in estuarine conditions, often with surface shells or stones, enabling the development of diverse epifaunal communities** **Species Observed** ***Marthasterias glacialis*, Cirripedia**	**A5.42**	

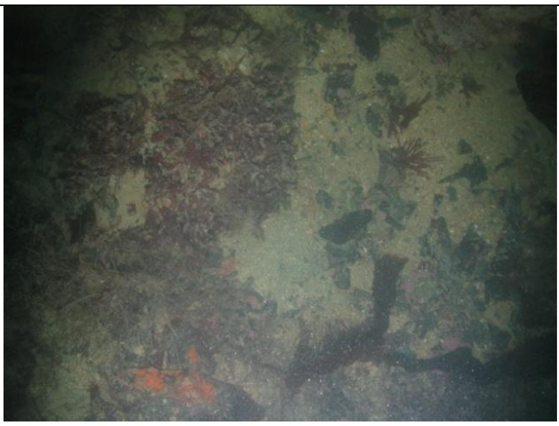
3.5.2 Falmouth Bay

Biotope	Eunis Code	
Foliose red seaweeds on exposed lower infralittoral rock (IR.HIR.KFaR.FoR) **Description** A dense turf of foliose red seaweeds on exposed or moderately exposed lower infralittoral rock, generally, at or below the lower limit of the kelp **Species Observed** *Cryptopleura ramosa*, *Asterias rubens*, *Marthasterias glacialis*	**A3.116**	
***Laminaria saccharina* and/or *Saccorhiza polyschides* on exposed infralittoral rock (IR.HIR.Ksed.LsacSac)** **Description** A forest or park of the fast-growing, opportunistic kelps [Laminaria saccharina] and/or [Saccorhiza polyschides] occurring on seasonally unstable boulders or sand/pebble scoured infralittoral rock **Species Observed** *Laminaria saccharina*, *Echinus esculentus*, *Marthasterias glacialis, Luidia ciliaris*	**A3.122**	
Dense *Desmerestia* sp. with filamentous red seaweeds in exposed infralittoral cobble, pebble and bedrock (IR.HIR.Ksed.DesFilR) **Description** Wave-exposed seasonally mobile substrata (pebbles, cobbles) dominated by dense stands of the brown seaweed [*Desmarestia aculeata*] and/or [*Desmarestia ligulata*] **Species Observed** *Desmerestia* sp., *Laminaria saccharina*, *Dictyota dichotoma*	**A3.124**	

Biotope	Eunis Code	
Mixed kelps with scour tolerant and opportunistic foliose red seaweeds on scoured or sand covered infralittoral rock (IR.HIR.Ksed.XKScrR) **Description** Bedrock and boulders, often in tide-swept areas, subject to scouring or periodic burial by sand, characterised by a canopy of mixed kelps such as [*Laminaria saccharina*], [*Laminaria hyperborea*] and [*Saccorhiza polyschides*] and the brown seaweed [*Desmarestia aculeata*] **Species Observed** *Laminaria saccharina*, *Dilsea carnosa*, *Asterias rubens*	**A3.125**	
***Haldrys* sp. and mixed kelps on tide swept infralittoral rock with coarse sediment (IR.HIR.Ksed.XKHal)** **Description** Tide-swept boulders and cobbles, often with a mobile component to the substrata (pebbles, gravel and sand), characterised by dense stands of the brown seaweed [*Halidrys siliquosa*] **Species Observed** *Halidrys silquosa*, *Botryllus schlosseri*	**A3.126**	
Kelp and red seaweeds on moderate energy infralittoral rock (IR.MIR.KR) **Description** Infralittoral rock subject to moderate wave exposure, or moderately strong tidal streams on more sheltered coasts **Species Observed** *Laminaria* spp., *Gibbula cineraria*	**A3.21**	

Biotope	Eunis Code	
Dense foliose red seaweeds on moderately exposed infralittoral rock (IR.MIR.KR.XFoR) **Description** **Upward-facing surfaces of shallow, infralittoral bedrock and boulders in areas of turbid water dominated by dense red seaweeds, with the notable absence of kelp** **Species Observed** ***Cryptopleura ramosa, Marthasterias glacialis***	**A3.215**	
***Laminaria saccharina* and *Laminaria digitata* on sheltered sublittoral fringe rock (IR.LIR.K.Lsac.Ldig)** **Description** **Sheltered bedrock and boulders in the sublittoral fringe characterised by a mixed canopy of the kelp [Laminaria digitata] (usually in its broad-fronded cape-form) and [Laminaria saccharina] - both species are generally Frequent or greater** **Species Observed** ***Laminaria digitata, Laminaria saccharina*,**	**A3.3131**	
Mixed faunal turf communities on circalittoral rock (CR.HCR.Xfa) **Description** **This habitat type occurs on wave-exposed circalittoral bedrock and boulders, subject to tidal streams ranging from strong to moderately strong** **Species Observed** ***Echinus esculentus***	**A4.13**	

Biotope	Eunis Code	
***Eunicella verrucosa* and *Pentapora fascialis* on wave exposed circalittoral rock (CR.HCR.Xfa.ByErSp.Eun)** **Description** Typically occurs on wave-exposed, steep, circalittoral bedrock, boulder slopes and outcrops, subject to varying tidal streams. Contains a diverse faunal community, dominated by the seafan [*Eunicella verrucosa*], the bryozoan [*Pentapora fascialis*] and the cup coral [*Caryophyllia smithii]* **Species Observed** *Pentapora fascialis, Eunicella verrucosa, Alcyonium digitatum, Holothuria forskali, Echinus esculentus, Marthasterias glacialis*	**A4.1311**	
Sublittoral sand (SS.Ssa) **Description** Clean medium to fine sands or non-cohesive slightly muddy sands on open coasts, offshore or in estuaries and marine inlets **Species Observed** No fauna visible.	**A5.2**	
Sublittoral mixed sediments (SS.SMx) **Description** Sublittoral mixed (heterogeneous) sediments found from the extreme low water mark to deep offshore circalittoral habitats. **Species Observed** *Marthasterias glacialis, Necora puber*	**A5.4**	

Biotope	Eunis Code	
***Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediments (SS.SMx.CMs.OphMx)** **Description** Circalittoral sediment dominated by brittlestars (hundreds or thousands m^{-2}) forming dense beds, living epifaunally on boulder, gravel or sedimentary substrata **Species Observed** *Ophiothrix fragilis, Ophiocomina nigra*	**A5.445**	
Red seaweeds and kelps on tide swept mobile infralittoral cobble and pebble (SS.SMp.KSwSS.LsacR.CbPb) **Description** Shallow mixed substrata of cobbles and pebbles swept by moderately strong tidal streams in exposed areas, and characterised by dense stands of red seaweeds **Species Observed** *Dictyota dichotoma, Cryptopleura ramosa*	**A5.5211**	

3.6 Human activities

3.6.1 River Fal

The survey was not specifically designed to establish the presence or effects arising from human activities. However, during the survey a number of human activities were observed within the River Fal. These included long-term moorings for a number of large vessels along the central area of the river (Figure 11) along with smaller recreational vessel trot moorings along the river margins. Additionally, the King Harry chain ferry operates between Feock and Philleigh which again restricted access to certain areas of the river (Figure 12).

Figure 11. Large vessels mooring along the central area of the River Fal.

Figure 12. King Harry chain ferry.

A number of aquaculture installations (primarily for mussel farming) were present to the immediate south of the King Harry ferry. Also, a number of oyster fishing boats were observed to be operating within the river during the survey. The fishery operates using non-mechanical means (namely rowing boats or by sail) with the dredges deployed and hauled by hand (Figure 13).

Figure 13. Oyster fishers in the River Fal.

3.6.2 Falmouth Bay

Human activities observed in Falmouth Bay included moorings and anchorages for a number of large vessels. Fishing activities were also observed in the Falmouth Bay survey area where a relatively high incidence of static fishing gear was encountered. Additionally, a number of sail powered oyster fishing vessels were observed to be operating in the area during the course of the survey (Figure 14).

Figure 14. Oyster fishing boat in Falmouth Bay.

4 Discussion

4.1 Summary of habitats recorded

4.1.1 River Fal

The sub-features of interest (namely subtidal rock and boulder) were identified to occur in the River Fal in the vicinity of Tom's Rock and North of Turnaware Point (Figure 7). Surrounding areas comprised mixed sediments and sand in variable salinity (A5.42 and A5.22 respectively). The rock and boulder habitats north of Turnaware point and around Tom's Rock were identified to support kelp species (*Laminaria saccharina* and *Laminaria digitata*) and foliose red algae along with the massive sponge *Cliona celata*. Mobile species inhabiting these rock areas included the spiny starfish *Marthasterias glacialis*, the hermit crab *Pagurus bernhardus* and the scallop *Pecten maximus*.

4.1.2 Falmouth Bay

The circalittoral rock habitats along the 20-30m depth contour in Falmouth bay were largely assigned to the biotope A4.1311 '*Eunicella verrucosa* and *Pentapora fascialis* on wave exposed circalittoral rock'. Stations assigned to this biotope were characterised by a number of attached epifaunal species including a number of encrusting and cushion sponges, the bryozoan *Pentapora fascialis*, the soft coral *Alcyonium digitatum*, the Devonshire cup coral *Carophyllia smithii*, the pink sea fan *Eunicella verrucosa* and a number of hydroid species including *Nemertesia* spp. Mobile species characteristic of this biotope included the echinoderms *Marthasterias glacialis*, *Echinus esculentus* and *Holothuria forskali*.

The survey stations located in the shallower, more inshore waters largely fell into the biotope classifications 'exposed lower infralittoral rock' (A3.116, A3.122, A3.124) and were characterised by the kelp *Laminaria saccharina*, encrusting and foliose red algae (*Dilsea carnosa*, *Cryptopleaura ramosa*) and the sea lettuce *Ulva lactuca*. The more sheltered, moderate energy infralittoral rock areas (A3.21, A3.215, A3.3131) were found to be similarly characterised by a variety of algal species including *Laminaria* spp., red foliose algae and the filamentous brown algae *Halidrys siliquosa*. Additional species which distinguished these less exposed infralittoral rock areas from the higher energy sites included the colonial ascidian *Botryllus schlosseri* and the common starfish *Asterias rubens*.

The mixed sediment and sand habitats interspersed between the rock outcrops had a number of associated characteristic epifauna including the brittlestars *Ophiothrix fragilis* and *Ophiocomina nigra*, common starfish *Asterias rubens* and the hermit crab *Pagurus bernhardus*.

4.2 Discuss identification of appropriate indicators to assess state of features

Monitoring of sub-features for which an SAC has been designated (along with their associated attributes) in support of Regulation 35 (formerly Regulation 33) requires an assessment of the extent and distribution of given features (and sub-features) and also the status (or condition) of their associated characteristic faunal communities (JNCC, 2004). Temporal reporting cycles vary according to the given feature or attribute. Therefore, monitoring in this context constitutes a robust evaluation of the presence and extent of those broadscale habitat features (and sub-features contained within them) along with a robust characterisation (over an appropriate temporal cycle) of their associated biotopes.

Whilst it is considered that such an evaluation was achieved by the 2011 survey, it is suggested that future monitoring would benefit from the application of acoustic techniques (bathymetric and backscatter) in advance of the groundtruthing survey to increase confidence that the full extent of the physical habitat features of interest has been identified. Where the presence, distribution and extent of the physical habitat feature has been robustly defined a more directed (and statistically informed) characterisation (and condition assessment) can be achieved through application of the required density of sampling to capture the spatial variability in the features of interest. Therefore, it is suggested that the appropriate methods and indicators for monitoring the features (and sub-features) of interest in this area comprise a combination of acoustic techniques along with groudtruthing surveys to allow spatial patterns in the status of the associated attributes (e.g., faunal community characteristics and their condition) to be evaluated. Such evaluations could be repeated at intervals to also provide a more robust temporal assessment of the features of interest. Robust characterisation of the attributes and evaluation of their condition traditionally employs a suite of measures (or indicators) to explore their species composition (including measures of diversity and evenness) along with assessments of their functional status.

4.3 Survey and Data Limitations

4.3.1 River Fal survey limitations

A number of limitations were identified during the course of the survey in the River Fal. Firstly, a number of the areas indicated by the sidescan sonar data to be comprised of the feature of interest (estuarine bedrock, boulder and cobble) were inaccessible to the survey vessel due to the presence of a number of moored vessels, and also by virtue of their proximity to the King Harry chain ferry.

Furthermore, despite timing the survey effort within the River Fal to coincide with predicted times for optimal visibility (slack water), high turbidity levels resulted in poor quality video (and few useable still images) from this region.

4.3.2 Falmouth Bay survey limitations

Survey within Falmouth Bay did not experience any limitations other than consideration of the presence and location of static fishing gear (strings of crab pots) when choosing the direction in which to proceed along the planned transect lines. This, however, did not result in any inaccessibility to the areas planned for survey.

4.3.3 Data Limitations

A number of limitations in the survey data collected were identified in terms of robustly assessing the necessary features of interest (and their associated attributes). For example, a number of limitations arise when employing video and still imaging (or diver observation) techniques either in isolation (or in combination). Whilst application of the SACFOR scale, to video transects or still images, is appropriate to inform patterns in biotopes and/or community characteristics of a given habitat, it can still only be considered to be qualitative (or semi-quantitative) data at best. Additional difficulties arise when attempting to use such data for the purposes of setting statistically robust measures of current (or changing) condition or status of the attributes of interest. These include inherent subjectivity (in terms of sediment descriptions and faunal identifications) which can be ameliorated to some extent by consistency in the post-processor and application of appropriate Quality Assurance (QA) processes. Furthermore, the effective acquisition of quantitative data (to which statistically robust analyses can be applied) is challenging when attempting to extract such data from images where field of view is variable (e.g., drop camera and diver surveys). Again, this can be ameliorated to some extent by the presence of a scaling devise (e.g., laser ranger finders) to assist in standardising the field of view (or effort) to minimise the effects of variable effort on those indicators affected (namely measures underpinned by species abundance or richness measures). Finally, where attempts are made to design and carry out surveys (using such techniques) to effectively assess current (or baseline) status (along with subsequent changes) existing data sets are required to allow variability across the features of interest to be defined. This provides the data required to inform the density of sampling needed to provide the desired power of detection of change (in the given indicator of interest) over the time period of interest. This is particularly important for those attributes which exhibit high levels of variability over relatively short time scales.

4.4 Anthropogenic impacts

A number of human activities were observed to be occurring within the survey areas during the period of the survey. However, the ability to confidently attribute any observations of current status (or subsequent changes in status) in the habitat features, and their associated faunal communities, to the potential effects of such human induced pressures is challenging. The ability to delineate natural fluctuations in the indicators utilised to infer condition of given attributes (traditionally measures of species composition, indicators of diversity and/or functional measures) is underpinned by a comprehensive understanding of the natural spatial and temporal variability exhibited by the given receptor or attribute of interest (e.g., species, community) and the metric employed to assess its status. Such assessments are reliant on a combination of directed research or operational monitoring (to robustly attribute observed negative state changes or impacts to given human pressures present). Additionally, sufficiently long time series data for comparable attributes (in comparable environmental regimes) are required to effectively delineate observed human induced changes from natural 'background' fluctuations.

However, the existence of previously acquired video data (collected during the 1994 survey) allowed any large scale changes over time in the high level biotope classifications to be explored. Comparisons were made between the 1994 and 2011 video (processed by the same post-processor using identical methods) acquired for the circalittoral rock and boulder habitats. Results indicated that broadscale biotope classifications for these 'historical' stations had remained unchanged over the 16 year time period that had elapsed between the two surveys.

5 Conclusions

5.1 Overall conclusions in relation to survey aims and objectives

Objective 1: Develop a cost effective sampling design to enable a measure of each sub-feature to be obtained

A sampling strategy was devised and executed that, within the limitations imposed by budget, time and environmental conditions, delivered data of sufficient quality to make an informed physical and biological assessment of the attributes of interest.

Objective 2: To make an assessment of change for each attribute against a baseline where it exists. Where it does not, produce a baseline against which future measures can be assessed

The biotopes identified, in association with the physical features and sub-features of interest, validated the presence and extent predicted and described from previous surveys. Areas of bedrock, as predicted by the sidescan sonar data, were validated by the groundtruthing video and stills survey and were found to be characterised by a variety of attached epifauna (namely cushion sponges and hydroids) along with a number of kelp species and foliose red and green algae.

The presence and extent of the features and sub-features (and associated attributes) of interest in Falmouth Bay (namely subtidal rocks and boulders supporting biotopes CR.HCR.XFa.ByErSp.Eun) were described using a combination of the Digital Elevation Model (DEM) bathymetry data and subsequent groudtruthing survey using video and still imaging techniques. Comparisons of video footage obtained at given stations during 1994 (Davies and Sotheran, 1995) and during the 2011 survey identified that their biotope classification had remained the same over the 17 year period between studies. The attribute CR.HCR.XFa.ByErSp.Sag was not identified during the 2012 survey. However, this should not be interpreted as a change in the status of this attribute but is instead more likely an artefact of the survey techniques employed (namely video and still imagery) and the inability to identify the characteristic (yet cryptic) species *Sagartia elegans* from images alone.

Objective 3: To assess for any signs of human derived damage or disturbance

Whilst a number of human activities were observed within the survey areas during the period of the survey, the ability to confidently attribute any observations of current status (or subsequent changes in status) in the habitat features, and their associated faunal communities, to the potential effects of such human induced pressures is not possible with the current survey design. The ability to delineate natural fluctuations in the indicators utilised to infer condition of given attributes (traditionally measures of species composition, indicators of diversity and/or functional measures) is underpinned by a comprehensive understanding of the natural spatial and temporal variability exhibited by the given receptor or attribute of interest (e.g., species, community) and the metric employed to assess its status. Such assessments are reliant on a combination of directed research or operational monitoring (to robustly attribute observed negative state changes or impacts to given human pressures present). Additionally, sufficiently long time series data for comparable attributes (in comparable environmental regimes) are required to effectively delineate observed human induced changes from natural 'background' fluctuations.

Objective 4: To report on any deficiencies of individual data collection methods or techniques
In light of the outcomes of the 2011 survey, a number of recommendations have emerged which will help inform and refine future monitoring effort for these sub-features and their associated attributes within the Fal and Helford SAC. Recommendations are provided on possible alternatives for future monitoring of the area given the limitations of the survey techniques within each habitat type. In particular, it is recommended that acoustic surveys are carried out, prior to groundtruthing, to provide a more scientifically robust assessment of the habitat features and sub-features in the SAC.

5.2 Future Monitoring Scheme

Recommendations for future monitoring surveys are given below:

- Assess the spatial extent and distribution of the physical features of interest through application of acoustic techniques (appropriate to the detection of the physical feature) prior to carrying out the groundtruthing surveys. For example, multibeam bathymetric surveys to delineate topographic features such as upstanding bedrock and/or backscatter data from sonar or multibeam echsounders for delineation of mixed sedimentary habitats.

- Apply groundtruthing techniques (appropriate to the feature of interest) at an adequate sampling density to effectively characterise the attributes associated with the features. This should be informed by acoustic data, and any previously obtained groundtruthing data, to provide information on their known spatial and temporal variability.

- The choice of appropriate groundtruthing techniques, to allow the collection of suitably robust and quantitative data, will vary depending on a number of factors. It is recommended that such considerations include, accessibility of the areas of interest (diver surveys may be preferable to video surveys where areas are inaccessible by larger survey vessels). Diver surveys may be also be preferable where there is a requirement to identify certain taxa to species level (a number of the algal species and sponges encountered during the survey cannot be identified using imaging techniques alone). Finally, it should be noted that all survey techniques employed have associated limitations. For example, increased accessibility to areas of interest using diver surveys will be offset by increased subjectivity of the resultant (largely qualitative) data set along with limited ability to standardise survey effort. This is also true, albeit to a lesser extent, when applying video survey techniques though the limitations in subsequent analyses (and the interpretation of results) of a largely qualitative resultant data set should equally be considered.

6 Acknowledgements

We would like to thank the crew of the survey vessel 'FPV Saint Piran and the environmental officers of the Cornwall IFCA for their expertise and assistance in making the survey a success. Additionally, we would like to thank Matthew Curtis for his contribution to video and still image processing and QA.

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8 Annexes

8.1 Survey metadata

Cruise Code	Stn No.	Gear	Date	SOL	EOL	Lat	Long	Depth (m)
SP1_11	24	DC	11/10/2011	10:14	10:25	50.207733	-5.035517	8.5
SP1_11	24	DC	11/10/2011	10:14	10:25	50.207433	-5.035767	6.5
SP1_11	25	DC	11/10/2011	10:34	10:48	50.207200	-5.033600	10.5
SP1_11	25	DC	11/10/2011	10:34	10:48	50.207750	-5.031917	8.5
SP1_11	26	DC	11/10/2011	11:16	11:20	50.224400	-5.017433	10.8
SP1_11	26	DC	11/10/2011	11:16	11:20	50.224600	-5.016300	12.6
SP1_11	27	DC	11/10/2011	11:39	11:48	50.226900	-5.015467	8.1
SP1_11	27	DC	11/10/2011	11:39	11:48	50.228550	-5.016333	9.5
SP1_11	28	DC	11/10/2011	13:08	13:11	50.223817	-5.018183	6.8
SP1_11	28	DC	11/10/2011	13:08	13:11	50.224017	-5.017383	8.3
SP1_11	29	DC	11/10/2011	13:23	13:29	50.223467	-5.020550	6.7
SP1_11	29	DC	11/10/2011	13:23	13:29	50.223467	-5.020583	4.9
SP1_11	30	DC	11/10/2011	14:33	14:41	50.146650	-5.038333	9.8
SP1_11	30	DC	11/10/2011	14:33	14:41	50.148017	-5.036900	10.3
SP1_11	31	DC	11/10/2011	14:58	15:09	50.124800	-5.052217	21.3
SP1_11	31	DC	11/10/2011	14:58	15:09	50.126800	-5.049900	21.7
SP1_11	32	DC	11/10/2011	15:22	15:34	50.114167	-5.068350	19.8
SP1_11	32	DC	11/10/2011	15:22	15:34	50.114483	-5.065200	19.7
SP1_11	33	DC	11/10/2011	15:43	15:53	50.121350	-5.056683	21.6
SP1_11	33	DC	11/10/2011	15:43	15:53	50.121900	-5.053500	21.2
SP1_11	34	DC	12/10/2011	09:08	09:17	50.025833	-5.072250	24.4
SP1_11	34	DC	12/10/2011	09:08	09:17	50.024550	-5.073250	23.1
SP1_11	35a	DC	12/10/2011	10:03	10:05	50.056550	-5.053150	19.9
SP1_11	35a	DC	12/10/2011	10:03	10:05	50.056067	-5.052417	17.1
SP1_11	35b	DC	12/10/2011	10:10	10:14	50.056400	-5.054267	18
SP1_11	35b	DC	12/10/2011	10:10	10:14	50.055750	-5.053233	14.8
SP1_11	36	DC	12/10/2011	10:32	10:38	50.063600	-5.053483	22.4
SP1_11	36	DC	12/10/2011	10:32	10:38	50.063217	-5.051467	34.7
SP1_11	37	DC	12/10/2011	10:52	10:59	50.068617	-5.058067	19.6
SP1_11	37	DC	12/10/2011	10:52	10:59	50.067867	-5.055650	23.8
SP1_11	38	DC	12/10/2011	11:29	11:39	50.075450	-5.066333	16.3
SP1_11	38	DC	12/10/2011	11:29	11:39	50.074717	-5.062900	20.2
SP1_11	39	DC	12/10/2011	12:17	12:24	50.082867	-5.066567	13.9
SP1_11	39	DC	12/10/2011	12:17	12:24	50.082667	-5.064367	16.2
SP1_11	40	DC	12/10/2011	12:36	12:47	50.080883	-5.050667	24.2
SP1_11	40	DC	12/10/2011	12:36	12:47	50.080367	-5.046633	26.1
SP1_11	41	DC	12/10/2011	12:57	13:06	50.085650	-5.047450	17.9
SP1_11	41	DC	12/10/2011	12:57	13:06	50.085917	-5.044367	21.4
SP1_11	42	DC	12/10/2011	13:15	13:20	50.090883	-5.038983	24.9
SP1_11	42	DC	12/10/2011	13:15	13:20	50.091133	-5.035683	28.1
SP1_11	43	DC	12/10/2011	13:41	13:54	50.085500	-5.059617	16.4
SP1_11	43	DC	12/10/2011	13:41	13:54	50.088667	-5.055400	16.4
SP1_11	44	DC	12/10/2011	14:12	14:21	50.088933	-5.063850	9.9
SP1_11	44	DC	12/10/2011	14:12	14:21	50.090117	-5.060917	14.8
SP1_11	45	DC	12/10/2011	14:36	14:38	50.089067	-5.067717	9.9
SP1_11	45	DC	12/10/2011	14:36	14:38	50.089333	-5.067050	9.9
SP1_11	46	DC	12/10/2011	15:01	15:07	50.093683	-5.071033	16.5
SP1_11	46	DC	12/10/2011	15:01	15:07	50.093667	-5.069117	18.8

Cruise Code	Stn No.	Gear	Date	SOL	EOL	Lat	Long	Depth (m)
SP1_11	47	DC	12/10/2011	15:19	15:26	50.102850	-5.065583	20.3
SP1_11	47	DC	12/10/2011	15:19	15:26	50.102867	-5.063200	21.1
SP1_11	48	DC	12/10/2011	15:42	15:51	50.098200	-5.045883	26.5
SP1_11	48	DC	12/10/2011	15:42	15:51	50.098850	-5.042333	23.1
SP1_11	49	DC	12/10/2011	16:02	16:13	50.108017	-5.031483	25.2
SP1_11	49	DC	12/10/2011	16:02	16:13	50.108767	-5.027900	28.7
SP1_11	50	DC	13/10/2011	08:21	08:30	50.213433	-5.026100	14.7
SP1_11	50	DC	13/10/2011	08:21	08:30	50.211967	-5.025117	10.1
SP1_11	51	DC	13/10/2011	08:39	08:43	50.211483	-5.026383	16.8
SP1_11	51	DC	13/10/2011	08:39	08:43	50.210467	-5.025767	16.8
SP1_11	52	DC	13/10/2011	09:04	09:13	50.219800	-5.025933	12.3
SP1_11	52	DC	13/10/2011	09:04	09:13	50.218483	-5.025667	11.2
SP1_11	53	DC	13/10/2011	09:28	09:29	50.223633	-5.021350	5.6
SP1_11	53	DC	13/10/2011	09:28	09:29	50.223717	-5.021633	6.7
SP1_11	54	DC	13/10/2011	09:47	10:05	50.221900	-5.027267	13.9
SP1_11	54	DC	13/10/2011	09:47	10:05	50.219233	-5.027150	10.5
SP1_11	55	DC	13/10/2011	12:07	12:13	50.093917	-5.074550	6.8
SP1_11	55	DC	13/10/2011	12:07	12:13	50.094050	-5.075000	7.4
SP1_11	56	DC	13/10/2011	12:26	12:36	50.091733	-5.072100	14.5
SP1_11	56	DC	13/10/2011	12:26	12:36	50.091467	-5.071017	15
SP1_11	57	DC	13/10/2011	12:48	12:50	50.102283	-5.080300	7.4
SP1_11	57	DC	13/10/2011	12:48	12:50	50.102350	-5.080750	6.4
SP1_11	58	DC	13/10/2011	12:55	13:03	50.101417	-5.077783	11.5
SP1_11	58	DC	13/10/2011	12:55	13:03	50.100967	-5.078133	10.1
SP1_11	59	DC	13/10/2011	13:11	13:19	50.093633	-5.068417	16.3
SP1_11	59	DC	13/10/2011	13:11	13:19	50.097433	-5.068283	16.5
SP1_11	60	DC	13/10/2011	13:30	13:39	50.091117	-5.053617	16.9
SP1_11	60	DC	13/10/2011	13:30	13:39	50.091650	-5.054283	17.2
SP1_11	61	DC	13/10/2011	13:48	13:52	50.096633	-5.054583	23.3
SP1_11	61	DC	13/10/2011	13:48	13:52	50.097133	-5.055283	23.4
SP1_11	62	DC	13/10/2011	14:10	14:15	50.102167	-5.037533	53.3
SP1_11	62	DC	13/10/2011	14:10	14:15	50.102783	-5.038383	55.8
SP1_11	63	DC	13/10/2011	14:25	14:37	50.101567	-5.038467	19.3
SP1_11	63	DC	13/10/2011	14:25	14:37	50.103233	-5.052817	21.5
SP1_11	64	DC	13/10/2011	15:06	15:10	50.072583	-5.063200	23.4
SP1_11	64	DC	13/10/2011	15:06	15:10	50.073017	-5.063633	22.9
SP1_11	65	DC	13/10/2011	15:22	15:35	50.082217	-5.059433	22.2
SP1_11	65	DC	13/10/2011	15:22	15:35	50.083733	-5.061050	20.3
SP1_11	66	DC	13/10/2011	15:50	15:58	50.109267	-5.069300	16
SP1_11	66	DC	13/10/2011	15:50	15:58	50.110200	-5.069367	15.4
SP1_11	67	DC	13/10/2011	16:15	16:28	50.125183	-5.033483	24.2
SP1_11	67	DC	13/10/2011	16:15	16:28	50.127117	-5.033883	21.1

8.2 Media catalogue

Cruise Code	Label	Stations
SP1_11	DVT 8	24, 25, 26, 27, 28, 29, 30
SP1_11	DVT 9	31, 32, 33, 34, 35
SP1_11	DVT 10	36, 37, 38, 39, 40, 41
SP1_11	DVT 11	42, 43, 44, 45, 46
SP1_11	DVT 12	47, 48, 49, 50, 51, 52, 53, 54
SP1_11	DVT 13	55, 56, 57, 58, 59, 60, 61
SP1_11	DVT 14	62, 63, 64, 65, 66, 67

8.3 Video data summary

Station	Date	Start_Lat	Start_Long	End_Lat	End_Long	EUNIS	Classification (MNCR Description)	MNCR Key
STN24_S1	11/10/2011	50.20770	-5.03550	50.20730	-5.03537	A3.36	Faunal communities on variable or reduced salinity infralittoral rock	IR.LIR.IFaVS
STN24_S2	11/10/2011	50.20730	-5.03537	50.20710	-5.03552	A5.42	Sublittoral mixed sediment in variable salinity (estuaries)	SS.SMx.SMxVS
STN24_S3	11/10/2011	50.20710	-5.03552	50.20710	-5.03563	A5.22	Sublittoral sand in variable salinity (estuaries)	SS.SSa.SSaVS
STN24_S4	11/10/2011	50.20710	-5.03563	50.20740	-5.03577	A5.42	Sublittoral mixed sediment in variable salinity (estuaries)	SS.SMx.SMxVS
STN25_S1	11/10/2011	50.20720	-5.03360	50.20750	-5.03282	A5.42	Sublittoral mixed sediment in variable salinity (estuaries)	SS.SMx.SMxVS
STN25_S2	11/10/2011	50.20750	-5.03282	50.20775	-5.03192	A3.36	Faunal communities on variable or reduced salinity infralittoral rock	IR.LIR.IFaVS
STN26_S1	11/10/2011	50.22440	-5.01748	50.22460	-5.01647	A5.42	Sublittoral mxed sediment in variable salinity	SS.SMx.SMxVS
STN27_S1	11/10/2011	50.22690	-5.01548	50.22690	-5.01548	A5.42	Sublittoral mxed sediment in variable salinity	SS.SMx.SMxVS
Stn 28_S1	11/10/2011	50.22400	-5.01750	50.22400	-5.01750	A5.22	Sublittoral sand in variable salinity (estuaries)	SS.Ssa.SSaVS
Stn 29_S1	11/10/2011	50.22348	-5.02053	50.22350	-5.01937	A5.42	Sublittoral mxed sediment in variable salinity	SS.SMx.SMxVS
STN30_S1	11/10/2011	50.14600	-5.03800	50.14800	-5.03600	A3.126	Halidrys and mixed kelps on tide swept infralittoral rock with coarse sediment	IR.HIR.Ksed.XKHal
STN31_S1	11/10/2011	50.12400	-5.05200	50.12600	-5.04900	A5.445	Ophiothrix fragilis and/or Ophiocomina nigra beds on sublittoral mixed sediments	SS.SMx.CMx.OphMx
STN32_S1	11/10/2011	50.11383	-5.06838	50.11447	-5.06537	A3.116	Foliose red seaweeds on exposed lower infralittoral rock	IR.HIR.KFaR.FoR
STN33_S1	11/10/2011	50.12135	-5.05672	50.12187	-5.05370	A3.116	Foliose red seaweeds on exposed lower infralittoral rock	IR.HIR.KFaR.FoR
STN34_S1	12/10/2011	50.02520	-5.07215	50.02458	-5.07323	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock	CR.HCR.Xfa.ByErSp.Eun
STN35_S1	12/10/2011	50.05640	-5.05427	50.05578	-5.05333	A3.122	Laminaria saccharides and/or Saccorhiza polyschides on exposed infralittoral rock	IR.HIR.Ksed.LsacSac
STN36_S1	12/10/2011	50.06360	-5.05350	50.06323	-5.05158	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock	CR.HCR.Xfa.ByErSp.Eun
STN37_S1	12/10/2011	50.06962	-5.05810	50.06790	-5.05580	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock	CR.HCR.Xfa.ByErSp.Eun
STN38_S1	12/10/2011	50.07547	-5.06642	50.07473	-5.06308	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock	CR.HCR.Xfa.ByErSp.Eun
STN39_S1	12/10/2011	50.08288	-5.06662	50.08268	-5.06447	A3.124	Dense Desmerestia sp. with red seaweeds on exposed infralittoral cobble, pebble and bedrock	IR.HIR.Ksed.DesFilR
STN40_S1	12/10/2011	50.08088	-5.05073	50.08087	-5.04678	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock	CR.HCR.Xfa.ByErSp.Eun
STN41_S1	12/10/2011	50.08565	-5.04747	50.08592	-5.04445	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock	CR.HCR.Xfa.ByErSp.Eun
STN42_S1	11/10/2011	50.09090	-5.03893	50.09110	-5.03583	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave-exposed circalittoral rock	CR.HCR.XFa.ByErSp.Eun
STN43_S1	12/10/2011	50.08550	-5.05960	50.08867	-5.05962	A5.5211	Red seaweeds and kelps on tide-swept mobile infralittoral cobbles and pebbles	SS.SMp.KSwSS.LsacR.CbPb
STN44_S1	12/10/2011	50.08890	-5.06385	50.09012	-5.06090	A3.3131	Laminaria saccharina and Laminaria digitata on sheltered sublittoral fringe rock	IR.LIR.K.Lsac.Ldig
STN45_S1	12/10/2011	50.08905	-5.06782	50.08927	-5.06727	A3.21	Kelp and red seaweeds on moderate energy infralittoral rock	IR.MIR.KR
STN46_S1	12/10/2011	50.09368	-5.07110	50.09367	-5.06918	A5.521	Laminaria sacharina and red seaweed on infralittoral sediments	SS.SMp.KSwSS.LsacR
STN47_S1	12/10/2011	50.10283	-5.06563	50.10287	-5.06333	A3.215	Dense foliose seaweeds on moderately exposed infralittoral rock	IR.MIR.KR.XFoR
STN48_S1	12/10/2011	50.09818	-5.04595	50.09882	-5.04252	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock	CR.HCR.Xfa.ByErSp.Eun
STN49_S1	12/10/2011	50.10802	-5.03152	50.10873	-5.02812	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock	CR.HCR.Xfa.ByErSp.Eun
STN50_S1	13/10/2011	50.21345	-5.02610	50.21197	-5.02512	A5.42	Sublittoral mixed sediments in variable salinity	SS.SMx.SMxVS
STN51_S1	13/10/2011	50.21148	-5.02638	50.21053	-5.02575	A5.42	Sublittoral mixed sediments in variable salinity	SS.SMx.SMxVS
STN52_S1	13/10/2011	50.21980	-5.02592	50.21852	-5.02567	A3.36	Faunal communities on variable or reduced salinity infralittoral rock	IR.LIR.IFaVS
STN54_S1	13/10/2011	50.22192	-5.02728	50.21925	-5.02713	A3.36	Faunal communities on variable or reduced salinity infralittoral rock	IR.LIR.IFaVS
STN55_S1	13/10/2011	50.09392	-5.07455	50.09405	-5.07498	A3.21	Kelp and red seaweeds on moderate energy infralittoral rock	IR.MIR.KR
STN56_S1	13/10/2011	50.09175	-5.07212	50.09147	-5.07105	A5.445	Ophiothrix fragilis and Ophiocomina nigra on sublittoral mixed sediments	SS.SMx.CMx.OphMx
STN57_S1	13/10/2011	50.10227	-5.08023	50.10235	-5.08068	A3.21	Kelp and red seaweeds on moderate energy infralittoral rock	IR.MIR.KR
STN58_S1	13/10/2011	50.10142	-5.07778	50.10097	-5.08100	A3.21	Kelp and red seaweeds on moderate energy infralittoral rock	IR.MIR.KR
STN59_S1	13/10/2011	50.09695	-5.06842	50.09742	-5.06827	A5.2	Sublittoral Sand	SS.Ssa
STN60_S1	13/10/2011	50.09113	-5.05357	50.09163	-5.05425	A3.215	Dense foliose seaweeds on moderately exposed infralittoral rock	IR.MIR.KR.XFoR
STN61_S1	13/10/2011	50.09663	-5.05453	50.09710	-5.05522	A5.2	Sublittoral Sand	SS.Ssa
STN62_S1	13/10/2011	50.10217	-5.03752	50.10240	-5.03770	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock	CR.HCR.Xfa.ByErSp.Eun
STN62_S2	13/10/2011	50.10240	-5.03772	50.10275	-5.03828	A5.2	Sublittoral Sand	SS.Ssa

STN63_S1	13/10/2011	50.10158	-5.05058	50.10317	-5.05273	A3.215	Dense foliose seaweeds on moderately exposed infralittoral rock	IR.MIR.KR.XFoR
STN64_S1	13/10/2011	50.07257	-5.06313	50.07298	-5.06360	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock	CR.HCR.Xfa.ByErSp.Eun
STN65_S1	13/10/2011	50.08220	-5.05943	50.08368	-5.06102	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock	CR.HCR.Xfa.ByErSp.Eun
STN66_S1	13/10/2011	50.10927	-5.06932	50.11018	-5.06937	A3.215	Dense foliose seaweeds on moderately exposed infralittoral rock	IR.MIR.KR.XFoR
STN67_S1	13/10/2011	50.12518	-5.03498	50.12710	-5.03388	A5.445	Ophiothrix fragilis and Ophiocomina nigra on sublittoral mixed sediments	SS.SMx.CMx.OphMx

8.4 Stills data summary

Station	Date	Still Ref	Lat	Long	EUNIS	MNCR Description	MNCR Key
STN24_S1	11/10/2011	Stn 24_0006	50.20760	-5.03536	A3.36	Faunal communities on variable or reduced salinity infralittoral rock	IR.LIR.IFaVS
STN24_S1	11/10/2011	Stn 24_0007	50.20750	-5.03533	A3.36	Faunal communities on variable or reduced salinity infralittoral rock	IR.LIR.IFaVS
STN24_S1	11/10/2011	Stn 24_0009	50.20740	-5.03533	A3.36	Faunal communities on variable or reduced salinity infralittoral rock	IR.LIR.IFaVS
STN24_S2	11/10/2011	Stn 24_0011	50.20730	-5.03538	A5.42	Sublittoral mixed sediment in variable salinity (estuaries)	SS.SMx.SMxVS
STN24_S2	11/10/2011	Stn 24_0014	50.20730	-5.03544	A5.42	Sublittoral mixed sediment in variable salinity (estuaries)	SS.SMx.SMxVS
STN24_S2	11/10/2011	Stn 24_0018	50.20710	-5.03480	A5.42	Sublittoral mixed sediment in variable salinity (estuaries)	SS.SMx.SMxVS
STN24_S3	11/10/2011	Stn 24_0020	50.20710	-5.03563	A5.22	Sublittoral sand in variable salinity (estuaries)	SS.SSa.SSaVS
STN24_S4	11/10/2011	Stn 24_0021	50.20710	-5.03566	A5.42	Sublittoral mixed sediment in variable salinity (estuaries)	SS.SMx.SMxVS
STN24_S4	11/10/2011	Stn 24_0022	50.20720	-5.03570	A5.42	Sublittoral mixed sediment in variable salinity (estuaries)	SS.SMx.SMxVS
STN24_S4	11/10/2011	Stn 24_0024	50.20730	-5.03573	A5.42	Sublittoral mixed sediment in variable salinity (estuaries)	SS.SMx.SMxVS
STN25_S1	11/10/2011	Stn 25_0028	50.20730	-5.03350	A5.42	Sublittoral mixed sediment in variable salinity (estuaries)	SS.SMx.SMxVS
STN25_S1	11/10/2011	Stn 25_0032	50.20740	-5.03330	A5.42	Sublittoral mixed sediment in variable salinity (estuaries)	SS.SMx.SMxVS
STN25_S1	11/10/2011	Stn 25_0036	50.20750	-5.03312	A5.42	Sublittoral mixed sediment in variable salinity (estuaries)	SS.SMx.SMxVS
STN25_S2	11/10/2011	Stn 25_0044	50.20770	-5.03250	A3.36	Faunal communities on variable or reduced salinity infralittoral rock	IR.LIR.IFaVS
STN25_S2	11/10/2011	Stn 25_0049	50.20770	-5.03220	A3.36	Faunal communities on variable or reduced salinity infralittoral rock	IR.LIR.IFaVS
STN25_S2	11/10/2011	Stn 25_0053	50.20780	-5.03212	A3.36	Faunal communities on variable or reduced salinity infralittoral rock	IR.LIR.IFaVS
STN30_S1	11/10/2011	Stn 30_0066	50.14685	-5.03813	A3.125	Mixed kelps with scour tolerant and red seaweeds on scoured or sand covered infralittoral rock	IR,HIR.Ksed.XKScrR
STN30_S1	11/10/2011	Stn 30_0075	50.14732	-5.03762	A3.126	Halidrys and mixed kelps on tide swept infralittoral rock with coarse sediment	IR.HIR.Ksed.XKHal
STN30_S1	11/10/2011	Stn 30_0081	50.14762	-5.03730	A3.126	Halidrys and mixed kelps on tide swept infralittoral rock with coarse sediment	IR.HIR.Ksed.XKHal
STN31_S1	11/10/2011	Stn 31_0087	50.12487	-5.05205	A5.445	Ophiothrix fragilis and/or Ophiocomina nigra beds on sublittoral mixed sediments	SS.Smx.CMx.OphMx
STN31_S1	11/10/2011	Stn 31_0102	50.12548	-5.05125	A5.445	Ophiothrix fragilis and/or Ophiocomina nigra beds on sublittoral mixed sediments	SS.Smx.CMx.OphMx
STN31_S1	11/10/2011	Stn 31_0122	50.12673	-5.05017	A5.445	Ophiothrix fragilis and/or Ophiocomina nigra beds on sublittoral mixed sediments	SS.Smx.CMx.OphMx
STN32_S1	11/10/2011	Stn 32_0129	50.11393	-5.06818	A3.116	Foliose red seaweeds on exposed lower infralittoral rock	IR.HIR.KFaR.FoR
STN32_S1	11/10/2011	Stn 32_0137	50.11405	-5.06795	A3.116	Foliose red seaweeds on exposed lower infralittoral rock	IR.HIR.KFaR.FoR
STN32_S1	11/10/2011	Stn 32_0156	50.11438	-5.06695	A3.116	Foliose red seaweeds on exposed lower infralittoral rock	IR.HIR.KFaR.FoR
STN33_S1	11/10/2011	Stn 33_0186	50.12140	-5.05648	A3.116	Foliose red seaweeds on exposed lower infralittoral rock	IR.HIR.KFaR.FoR
STN33_S1	11/10/2011	Stn 33_0210	50.12173	-5.05472	A3.116	Foliose red seaweeds on exposed lower infralittoral rock	IR.HIR.KFaR.FoR
STN33_S1	11/10/2011	Stn 33_0214	50.12180	-5.05433	A3.116	Foliose red seaweeds on exposed lower infralittoral rock	IR.HIR.KFaR.FoR
STN34_S1	12/10/2011	Stn 34_0001	50.02520	-5.07217	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN34_S1	12/10/2011	Stn 34_0017	50.02495	-5.07278	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN34_S1	12/10/2011	Stn 34_0024	50.02482	-5.07310	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN35_S1	12/10/2011	Stn 35_0037	50.05632	-5.05422	A3.116	Foliose red seaweeds on exposed, lower infralittoral rock	IR.HIR.KFaR.FoR

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STN35_S1	12/10/2011	Stn 35_0041	50.05603	-5.05385	A3.122	Laminaria saccharina and/or Saccorhiza polyschides on exposed infralittoral rock.	IR.HIR.Ksed.LsacSac
STN35_S1	12/10/2011	Stn 35_0044	50.05588	-5.05353	A3.122	Laminaria saccharina and/or Saccorhiza polyschides on exposed infralittoral rock.	IR.HIR.Ksed.LsacSac
STN36_S1	12/10/2011	Stn 36_0052	50.06362	-5.05297	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN36_S1	12/10/2011	Stn 36_0055	50.06357	-5.05280	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN36_S1	12/10/2011	Stn 36_0063	50.06337	-5.05205	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN37_S1	12/10/2011	Stn 37_0072	50.06848	-5.05758	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN37_S1	12/10/2011	Stn 37_0074	50.06845	-5.05733	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN37_S1	12/10/2011	Stn 37_0080	50.06823	-5.05668	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN38_S1	12/10/2011	Stn 38_0089	50.07570	-5.06592	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN38_S1	12/10/2011	Stn 38_0092	50.07530	-5.06538	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN38_S1	12/10/2011	Stn 38_0105	50.07487	-5.06357	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN39_S1	12/10/2011	Stn 39_0110	50.08282	-5.06640	A3.124	Dense Desmerestia sp. with red seaweeds on exposed infralittoral cobble, pebble and bedrock	IR.HIR.Ksed.DesFilR
STN39_S1	12/10/2011	Stn 39_0116	50.08272	-5.06567	A3.124	Dense Desmerestia sp. with red seaweeds on exposed infralittoral cobble, pebble and bedrock	IR.HIR.Ksed.DesFilR
STN39_S1	12/10/2011	Stn 39_0119	50.08273	-5.06543	A3.124	Dense Desmerestia sp. with red seaweeds on exposed infralittoral cobble, pebble and bedrock	IR.HIR.Ksed.DesFilR
STN40_S1	12/10/2011	Stn 40_0129	50.08088	-5.05062	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN40_S1	12/10/2011	Stn 40_0145	50.08117	-5.04890	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN40_S1	12/10/2011	Stn 40_0157	50.08070	-5.04753	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN41_S1	12/10/2011	Stn 41_0162	50.08565	-5.04728	A4.13	Mixed faunal turf communities on circalittoral rock	CR.HCR.Xfa
STN41_S1	12/10/2011	Stn 41_0166	50.08573	-5.04700	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN41_S1	12/10/2011	Stn 41_0186	50.08593	-5.04455	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN42_S1	11/10/2011	Stn 42_0189	50.09090	-5.03870	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave-exposed circalittoral rock	CR.HCR.XFa.ByErSp.Eun
STN42_S1	11/10/2011	Stn 42_0201	50.09160	-5.03635	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave-exposed circalittoral rock	CR.HCR.XFa.ByErSp.Eun
STN42_S1	11/10/2011	Stn 42_0208	50.09110	-5.03635	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave-exposed circalittoral rock	CR.HCR.XFa.ByErSp.Eun
STN43_S1	12/10/2011	Stn 43_0213	50.08560	-5.05950	A5.5211	Red seaweeds and kelps on tide-swept mobile infralittoral cobbles and pebbles	SS.SMp.KSwSS.LsacR.CbPb
STN43_S1	12/10/2011	Stn 43_0224	50.08640	-5.05798	A5.5211	Red seaweeds and kelps on tide-swept mobile infralittoral cobbles and pebbles	SS.SMp.KSwSS.LsacR.CbPb
STN43_S1	12/10/2011	Stn 43_0234	50.08830	-5.05665	A5.5211	Red seaweeds and kelps on tide-swept mobile infralittoral cobbles and pebbles	SS.SMp.KSwSS.LsacR.CbPb
STN44_S1	12/10/2011	Stn 44_0242	50.08900	-5.06360	A3.3131	Laminaria saccharina and Laminaria digitata on sheltered sublittoral fringe rock	IR.LIR.K.Lsac.Ldig
STN44_S1	12/10/2011	Stn 44_0246	50.08930	-5.06300	A3.3131	Laminaria saccharina and Laminaria digitata on sheltered sublittoral fringe rock	IR.LIR.K.Lsac.Ldig
STN44_S1	12/10/2011	Stn 44_0254	50.08990	-5.06147	A3.3131	Laminaria saccharina and Laminaria digitata on sheltered sublittoral fringe rock	IR.LIR.K.Lsac.Ldig
STN45_S1	12/10/2011	Stn 45_0257	50.08910	-5.06765	A5.21	Kelp and red seaweeds on moderate energy infralittoral rock	IR.MIR.KR
STN45_S1	12/10/2011	Stn 45_0258	50.08920	-5.06745	A5.21	Kelp and red seaweeds on moderate energy infralittoral rock	IR.MIR.KR
STN46_S1	12/10/2011	Stn 46_0261	50.09370	-5.07080	A5.521	Laminaria sacharina and red seaweed on infralittoral sediments	SS.SMp.KSwSS.LsacR
STN46_S1	12/10/2011	Stn 46_0263	50.09370	-5.07057	A5.521	Laminaria sacharina and red seaweed on infralittoral sediments	SS.SMp.KSwSS.LsacR
STN46_S1	12/10/2011	Stn 46_0269	50.08690	-5.06957	A5.521	Laminaria sacharina and red seaweed on infralittoral sediments	SS.SMp.KSwSS.LsacR

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STN47_S1	12/10/2011	Stn 47_0272	50.10288	-5.06540	A5.215	Dense foliose red seaweeds on moderately exposed infralittoral rock	IR.MIR.KR.XFoR
STN47_S1	12/10/2011	Stn 47_0278	50.10288	-5.06468	A5.215	Dense foliose red seaweeds on moderately exposed infralittoral rock	IR.MIR.KR.XFoR
STN47_S1	12/10/2011	Stn 47_0285	50.10288	-5.06338	A5.215	Dense foliose red seaweeds on moderately exposed infralittoral rock	IR.MIR.KR.XFoR
STN48_S1	12/10/2011	Stn 48_0289	50.09832	-5.04530	A4.13	Mixed faunal turf communities on circalittoral rcok	CR.HCR.Xfa
STN48_S1	12/10/2011	Stn 48_0300	50.09848	-5.04392	A4.13	Mixed faunal turf communities on circalittoral rcok	CR.HCR.Xfa
STN48_S1	12/10/2011	Stn 48_0307	50.09862	-5.04332	A4.13	Mixed faunal turf communities on circalittoral rcok	CR.HCR.Xfa
STN49_S1	12/10/2011	Stn 49_0321	50.10817	-5.03047	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN49_S1	12/10/2011	Stn 49_0331	50.10847	-5.02913	A4.13	Mixed faunal turf communities on circalittoral rcok	CR.HCR.Xfa
STN49_S1	12/10/2011	Stn 49_0333	50.10855	-5.02883	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN50_S1	13/10/2011	Stn 50_0010	50.21253	-5.02595	A5.42	Sublittoral mixed sediment in variable salinity	SS.SMx.SMxVS
STN50_S1	13/10/2011	Stn 50_0011	50.21245	-5.02583	A5.42	Sublittoral mixed sediment in variable salinity	SS.SMx.SMxVS
STN50_S1	13/10/2011	Stn 50_0012	50.21238	-5.02570	A5.42	Sublittoral mixed sediment in variable salinity	SS.SMx.SMxVS
STN51_S1	13/10/2011	Stn 51_0021	50.21138	-5.02638	A5.42	Sublittoral mixed sediment in variable salinity	SS.SMx.SMxVS
STN51_S1	13/10/2011	Stn 51_0024	50.21108	-5.02600	A5.42	Sublittoral mixed sediment in variable salinity	SS.SMx.SMxVS
STN51_S1	13/10/2011	Stn 51_0030	50.21067	-5.02572	A5.42	Sublittoral mixed sediment in variable salinity	SS.SMx.SMxVS
STN55_S1	13/10/2011	Stn 55_0095	50.09393	-5.07458	A3.21	Kelp and red seaweeds on moderate energy infralittoral rock	IR.MIR.KR
STN55_S1	13/10/2011	Stn 55_0101	50.09400	-5.07478	A3.21	Kelp and red seaweeds on moderate energy infralittoral rock	IR.MIR.KR
STN55_S1	13/10/2011	Stn 55_0104	50.09403	-5.07490	A3.21	Kelp and red seaweeds on moderate energy infralittoral rock	IR.MIR.KR
STN56_S1	13/10/2011	Stn 56_0111	50.09165	-5.07200	A5.4	Sublittoral mixed sediment	SS.SMx
STN56_S1	13/10/2011	Stn 56_0130	50.09147	-5.07152	A5.445	Ophiothrix fragilis and Ophiocomina nigra on sublittoral mixed sediments	SS.SMx.CMx.OphMx
STN56_S1	13/10/2011	Stn 56_0138	50.09147	-5.07110	A5.445	Ophiothrix fragilis and Ophiocomina nigra on sublittoral mixed sediments	SS.SMx.CMx.OphMx
STN57_S1	13/10/2011	Stn 57_0141	50.10230	-5.08038	A3.21	Kelp and red seaweeds on moderate energy infralittoral rock	IR.MIR.KR
STN57_S1	13/10/2011	Stn 57_0143	50.10232	-5.08067	A3.21	Kelp and red seaweeds on moderate energy infralittoral rock	IR.MIR.KR
STN57_S1	13/10/2011	Stn 57_0145	50.10235	-5.08067	A3.21	Kelp and red seaweeds on moderate energy infralittoral rock	IR.MIR.KR
STN58_S1	13/10/2011	Stn 58_0154	50.10128	-5.07768	A3.21	Kelp and red seaweeds on moderate energy infralittoral rock	IR.MIR.KR
STN58_S1	13/10/2011	Stn 58_0173	50.10100	-5.07795	A3.21	Kelp and red seaweeds on moderate energy infralittoral rock	IR.MIR.KR
STN58_S1	13/10/2011	Stn 58_0176	50.10098	-5.07803	A3.21	Kelp and red seaweeds on moderate energy infralittoral rock	IR.MIR.KR
STN59_S1	13/10/2011	Stn 59_0180	50.09695	-5.06837	A5.2	Sublittoral Sand	SS.Ssa
STN59_S1	13/10/2011	Stn 59_0186	50.09697	-5.06847	A5.2	Sublittoral Sand	SS.Ssa
STN59_S1	13/10/2011	Stn 59_0189	50.09705	-5.06840	A5.2	Sublittoral Sand	SS.Ssa
STN60_S1	13/10/2011	Stn 60_0203	50.09112	-5.05367	A5.215	Dense foliose red seaweeds on moderately exposed infralittoral rock	IR.MIR.KR.XFoR
STN60_S1	13/10/2011	Stn 60_0207	50.09115	-5.05378	A5.215	Dense foliose red seaweeds on moderately exposed infralittoral rock	IR.MIR.KR.XFoR
STN60_S1	13/10/2011	Stn 60_0226	50.09153	-5.05422	A5.215	Dense foliose red seaweeds on moderately exposed infralittoral rock	IR.MIR.KR.XFoR
STN61_S1	13/10/2011	Stn 61_0231	50.09653	-5.05448	A5.2	Sublittoral Sand	SS.Ssa

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STN61_S1	13/10/2011	Stn 61_0235	50.09682	-5.05497	A5.2	Sublittoral Sand	SS.Ssa
STN61_S1	13/10/2011	Stn 61_0237	50.09695	-5.05507	A5.2	Sublittoral Sand	SS.Ssa
STN62_S1	13/10/2011	Stn 62_0240	50.10220	-5.03753	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN62_S1	13/10/2011	Stn 62_0242	50.10223	-5.03757	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN62_S1	13/10/2011	Stn 62_0244	50.10227	-5.03758	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN62_S1	13/10/2011	Stn 62_0247	50.10238	-5.03770	A5.2	Sublittoral Sand	SS.Ssa
STN62_S1	13/10/2011	Stn 62_0249	50.10253	-5.03790	A5.2	Sublittoral Sand	SS.Ssa
STN62_S1	13/10/2011	Stn 62_0251	50.10265	-5.03807	A5.2	Sublittoral Sand	SS.Ssa
STN63_S1	13/10/2011	Stn 63_0258	50.10163	-5.05073	A3.215	Dense foliose seaweeds on moderately exposed infralittoral rock	IR.MIR.KR.XFoR
STN63_S1	13/10/2011	Stn 63_0276	50.10233	-5.05160	A3.215	Dense foliose seaweeds on moderately exposed infralittoral rock	IR.MIR.KR.XFoR
STN63_S1	13/10/2011	Stn 63_0293	50.10282	-5.05227	A3.215	Dense foliose seaweeds on moderately exposed infralittoral rock	IR.MIR.KR.XFoR
STN64_S1	13/10/2011	Stn 64_0306	50.07268	-5.06328	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN64_S1	13/10/2011	Stn 64_0310	50.07273	-5.06332	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN64_S1	13/10/2011	Stn 64_0311	50.07275	-5.06333	A4.1311	Eunicella verrucosa and Pentapora fascialis on wave exposed circalittoral rock.	CR.HCR.Xfa.ByErSp.Eun
STN65_S1	13/10/2011	Stn 65_0323	50.08227	-5.05965	A3.13	Mixed faunal turf communities on circalittoral rcok	CR.HCR.Xfa
STN65_S1	13/10/2011	Stn 65_0344	50.08300	-5.06057	A3.13	Mixed faunal turf communities on circalittoral rcok	CR.HCR.Xfa
STN65_S1	13/10/2011	Stn 65_0363	50.08357	-5.06095	A3.13	Mixed faunal turf communities on circalittoral rcok	CR.HCR.Xfa
STN66_S1	13/10/2011	Stn 66_0368	50.10933	-5.06928	A5.215	Dense foliose red seaweeds on moderately exposed infralittoral rock	IR.MIR.KR.XFoR
STN66_S1	13/10/2011	Stn 66_0377	50.10965	-5.06922	A5.215	Dense foliose red seaweeds on moderately exposed infralittoral rock	IR.MIR.KR.XFoR
STN66_S1	13/10/2011	Stn 66_0393	50.11017	-5.06937	A5.215	Dense foliose red seaweeds on moderately exposed infralittoral rock	IR.MIR.KR.XFoR
STN67_S1	13/10/2011	Stn 67_0394	50.12522	-5.03498	A5.445	Ophiothrix fragilis and Ophiocomina nigra on sublittoral mixed sediments	SS.SMx.CMx.OphMx
STN67_S1	13/10/2011	Stn 67_0424	50.12633	-5.03425	A5.445	Ophiothrix fragilis and Ophiocomina nigra on sublittoral mixed sediments	SS.SMx.CMx.OphMx
STN67_S1	13/10/2011	Stn 67_0443	50.12700	-5.03397	A5.445	Ophiothrix fragilis and Ophiocomina nigra on sublittoral mixed sediments	SS.SMx.CMx.OphMx

About us

Cefas is a multi-disciplinary scientific research and consultancy centre providing a comprehensive range of services in fisheries management, environmental monitoring and assessment, and aquaculture to a large number of clients worldwide.

We have more than 500 staff based in 2 laboratories, our own ocean-going research vessel, and over 100 years of fisheries experience.

We have a long and successful track record in delivering high-quality services to clients in a confidential and impartial manner.
(www.cefas.defra.gov.uk)

Cefas Technology Limited (CTL) is a wholly owned subsidiary of Cefas specialising in the application of Cefas technology to specific customer needs in a cost-effective and focussed manner.

CTL systems and services are developed by teams that are experienced in fisheries, environmental management and aquaculture, and in working closely with clients to ensure that their needs are fully met.
(www.cefastechnology.co.uk)

Customer focus

With our unique facilities and our breadth of expertise in environmental and fisheries management, we can rapidly put together a multi-disciplinary team of experienced specialists, fully supported by our comprehensive in-house resources.

Our existing customers are drawn from a broad spectrum with wide ranging interests. Clients include:

- international and UK government departments
- the European Commission
- the World Bank
- Food and Agriculture Organisation of the United Nations (FAO)
- oil, water, chemical, pharmaceutical, agro-chemical, aggregate and marine industries
- non-governmental and environmental organisations
- regulators and enforcement agencies
- local authorities and other public bodies

We also work successfully in partnership with other organisations, operate in international consortia and have several joint ventures commercialising our intellectual property

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Further information

Natural England evidence can be downloaded from our **Access to Evidence Catalogue**. For more information about Natural England and our work see **Gov.UK**. For any queries contact the Natural England Enquiry Service on 0300 060 3900 or e-mail **enquiries@naturalengland.org.uk**.

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