South Devon Reef Video Baseline Surveys for the Prawle Point to Plymouth Sound & Eddystone cSAC and Surrounding Areas

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| 5th May 2011 |

| R.Ross, University of Plymouth|

Acknowledgements

This contract was completed for Natural England by the University of Plymouth Marine Institute in partnership with the University of Plymouth Enterprise Ltd. Thanks goes to:

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Summary

This report presents the results of a video survey of the Annex 1 reefs of Prawle Point to Plymouth Sound and Eddystone candidate SAC, the Prawle Point to Start Point possible SAC, and of the Torbay portion of the Lyme Bay & Torbay candidate SAC, as undertaken by the University of Plymouth for the benefit of Natural England. The resulting dataset aims to provide a baseline for future monitoring surveys.

This survey identified

- 136 species
- 13 species are considered to be of conservation interest due to Nationally Rare, Nationally Scarce or UK Biodiversity Action Plan listing.
- 17 different biotopes
- 1 of the 17 biotopes identified is a potentially new transitive biotope

This report includes

- Survey and Sampling Methodologies
- Standard Operating Protocols (SOPs)
- Listed species and communities by region
- Community EUNIS classifications
- Preliminary assement of feature condition recommendations
- Quick reference conclusions overall and by region.
- Maps of the regions, transect locations, and community data.

Contents

Appendices

List of tables

List of figures

List of plates

1 Introduction

1.1 The Habitats and Birds Directives provide for the creation of a network of protected areas (Natura 2000), for important or threatened wildlife habitats across the European Union. Natural England is the Government's statutory advisor in identifying and proposing marine habitats in territorial waters around the coast of England. These are to be designated as marine Special Areas of Conservation (SACs) under the Habitats Directive. In the South West, Natural England is progressing 4 candidate SACs (Lyme Bay & Torbay, Prawle Point to Plymouth Sound & Eddystone, Lizard Point, and Lands End & Cape Bank) and 2 possible SACs (Prawle Point to Start Point, and Studland to Portland) for designation by the end of 2012. They are all to be designated solely for their subtidal reef features with the exception of the Lyme Bay and Torbay cSAC which also contains an area of subtidal sea caves.

1.2 The University of Plymouth were commissioned by Natural England to supply this baseline survey of the Prawle Point to Plymouth Sound and Eddystone candidate SAC (cSAC) Annex I reefs, the Prawle Point to Start Point possible SAC (pSAC) Annex 1 reefs and of the Torbay portion of the Lyme Bay & Torbay cSAC Annex I reefs with survey results apportioned to:

- The Plymouth Sound to Bigbury Bay reefs and the West Rutts to Prawle Point reefs
- The Eddystone Reefs
- The Prawle Point to Start Point Reefs
- The Mackerel Cove to Dartmouth Reefs

1.3 The relevant Areas of Search were demarked by a previous survey (Royal Haskoning, 2008) with a focus on Annex I habitat.

1.4 This survey supplies video and stills images of multiple transects within each of the above regions, providing data that gives a broad overview of the biotopes present within the surveyed area, and that can provide a comparative baseline dataset, which will allow any future changes in reef condition to be detected. No acoustic survey or physical benthic sampling was commissioned.

Aims & Objectives

1.5 All aims and objectives were achieved to the highest standard possible within the time and funds allocated to the task. This project aimed to:

i. Acquire high quality baseline biological data suitable for use in the long term monitoring of the Annex I reefs in the cSACs between Prawle Point and Plymouth Sound (PPSE), Eddystone, Prawle Point to Start Point, and between Mackerel Cove and Dartmouth.
ii. Supply data that can contribute towards evidence of reef extent, biotope composition, and distribution and spatial patterns of biotopes at the specified locations. [The presence, extent and species composition of representative and notable biotopes encountered was discerned in accordance with common standards monitoring as defined by the Joint Nature and Conservation Committee (JNCC)].
iii. Keep the Natural England nominated project officer informed throughout the design implementation and reporting of the work undertaken.
iv. Develop a cost effective sampling design with the approval of Natural England.
v. Undertake and coordinate a survey as defined by our objectives and survey plan.

vi. Undertake appropriate analysis in a manner that is comparable with future and existing data.
vii. Provide fully detailed Standard Operating Protocols for future monitoring.
viii. Provide an assessment of the conditions of reef features in accordance with Common Standards Monitoring.
ix. Report detailed findings to Natural England in a clear and succinct report, including GIS layers.
x. Provide all data in the appropriate MESH Data Exchange Format.

2 Methodology

2.1 All methodologies undertaken were closely based around the Standard Operating Protocols supplied by Cefas whilst also aiming to be comparable to the data acquired by the DEFRA commissioned Lyme Bay Monitoring Study currently also being completed by the University of Plymouth. The University of Plymouth Marine Institute is a member of the NMBAQC and the project manager for this survey, Dr Kerry Howell, has contributed to the development of the video ring tests as well as having worked for JNCC to critically evaluate the MESH Recommended Operating Guidelines (ROGs) for underwater video and photographic imaging techniques. As such these guidelines were carefully considered throughout survey planning and analysis.

Sampling Design

2.2 The survey area was defined by GIS layers supplied by Natural England of the Annex 1 reef detected by Royal Haskoning in 2008. The number of transects undertaken was determined by cost and time available. Due to the large size of the sampling area and with reefs at depths of 5m-70m, the transect allocation was subject to stratification in order to account for known environmental variables that may affect results. The number of transects allocated to each of the four regions was proportional to the area of Annex I reef per region. Within each region sampling was stratified by 10m depth band in order to ensure sampling across those environmental parameters that vary with depth e.g. light penetrations, wave exposure etc..

2.3 As the majority of the Annex I reef was situated inshore, sample effort where possible was proportional to the extent of reef in each depth zone so that more sample effort was concentrated inshore. Hereafter transects were allocated randomly within a depth band, with replication undertaken where possible.

2.4 In total 42 transects were surveyed under this original portion of the contract, agreed transect locations by region are available to view on the next page. It was hoped that a further 38 transects could be surveyed and provided without quantitative analysis but unfortunately this was not possible due to the late start of the contract, poor weather going into winter, and ultimately the time available. The agreed transect locations are shown in Figure 1 and in more detail in Appendix 6.

2.5 Due to the addition of an addendum to this contract, the survey also included a further 29 transects in the Mackerel Cove to Dartmouth Reefs portion of the Survey Area. The aim of the addendum was to provide the locations of stony Annex 1 reef in the Torbay area. After completion of the contract addendum it was decided to include these transects in the quantitative analysis of the original contract. The locations of the 29 additional Torbay transects are displayed on the following page, Figure 2.

2.6 The sampling unit was an HD video transect, 200m in length and approximately 20 minutes in duration as undertaken by the Lyme Bay Monitoring Study (Attrill and others (In prep.); Attrill and others 2009; website available in References).

Survey Method

2.7 This survey was made by both Remotely Operated Vehicle (ROV) and by a towed off-bottom sledge known as the Flying Array which is the same apparatus as is used in the Lyme Bay monitoring study (Sheehan et al., 2010). Equipment and vessel specifications are cited in

Appendix A. Initial plans intended the survey to be conducted solely by ROV, with only a comparative study using the Flying Array, however circumstances required fall back onto the Flying Array as redundancy equipment. Accordingly, due to apparatus specific requirements, the methods are detailed here by equipment.

2.8 The standard operating protocol as reported by Roger Coggan in 2008 for the acquisition of images from the Natural England Lizard & Cape Bank SAC Project C2776 was closely followed where appropriate and is included in Appendix B for comparison.

ROV Transect Strategy

2.9 The ROV was launched from the University of Plymouth research vessel R.V. Falcon Spirit, which anchored at one end of the transect. The transect location and direction was as close to the planned coordinates as possible with adjustments made where wind, tide or fishing activity required them.

2.10 HD video camera, additional standard definition video camera, Conductivity Temperature and Depth sensor (CTD), and Ultra-Short Base Line (USBL) system clocks were synchronised before launching. The video footage displayed an overlay of station, time and date for ease of data synchronisation[1]. All systems were set to record from time of launch.

Plate 1 The launch and operation of the Seaeye Falcon ROV from the RV Falcon Spirit.

2.11 Once launched, the ROV was navigated vertically down until reaching the sea bed at which point time was taken to adjust lighting and buoyancy. A start time was then noted and the ROV steered along a single heading for 200m following the bottom profile. The Seaeye falcon ROV system has a direct reading of this distance from the vessel with the USBL system recording the GPS coordinates of the ROV once a second.

2.12 Field notes were made throughout each transect to give a basic overview of the benthic landscape and provide operational notes for quick reference during the analysis procedure. After 200m a finish time was noted and the ROV retrieved on a reciprocal bearing.

2.13 The stills camera was removed from the ROV to minimise weight and improve handling. An HD frame grabbing software, was used to generate high quality stills from the HD footage in replacement of a stills camera. This occurred during the analysis phase.

Flying Array Transect Strategy

2.14 As the flying array is a towed system it was launched from an unanchored vessel which towed the apparatus at an average optimal speed of 0.4knots. As this was not an achievable speed for the high sided, twin-hulled RV Falcon Spirit, Miss Pattie provided the launch platform. This is the

[1] A few initial transects do not have this overlay on the HD footage

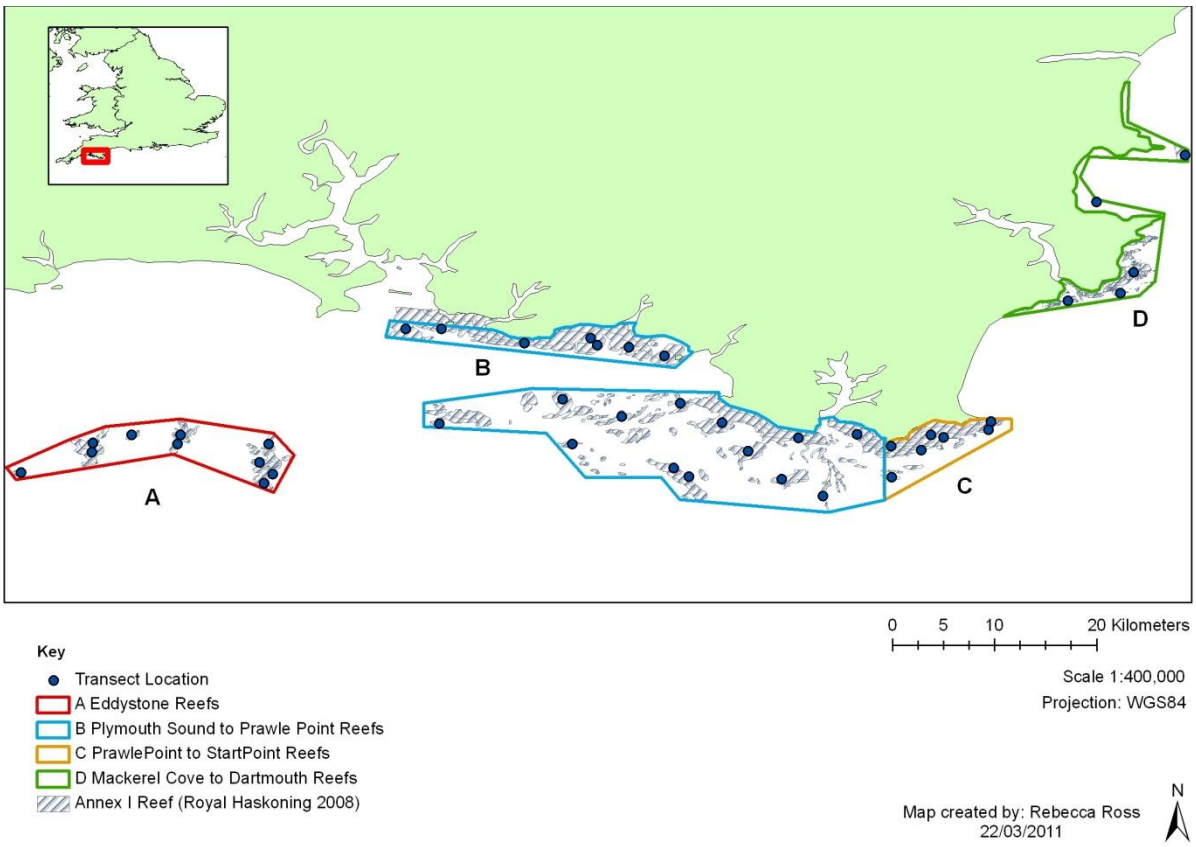


Figure 1 Agreed transect locations by region.

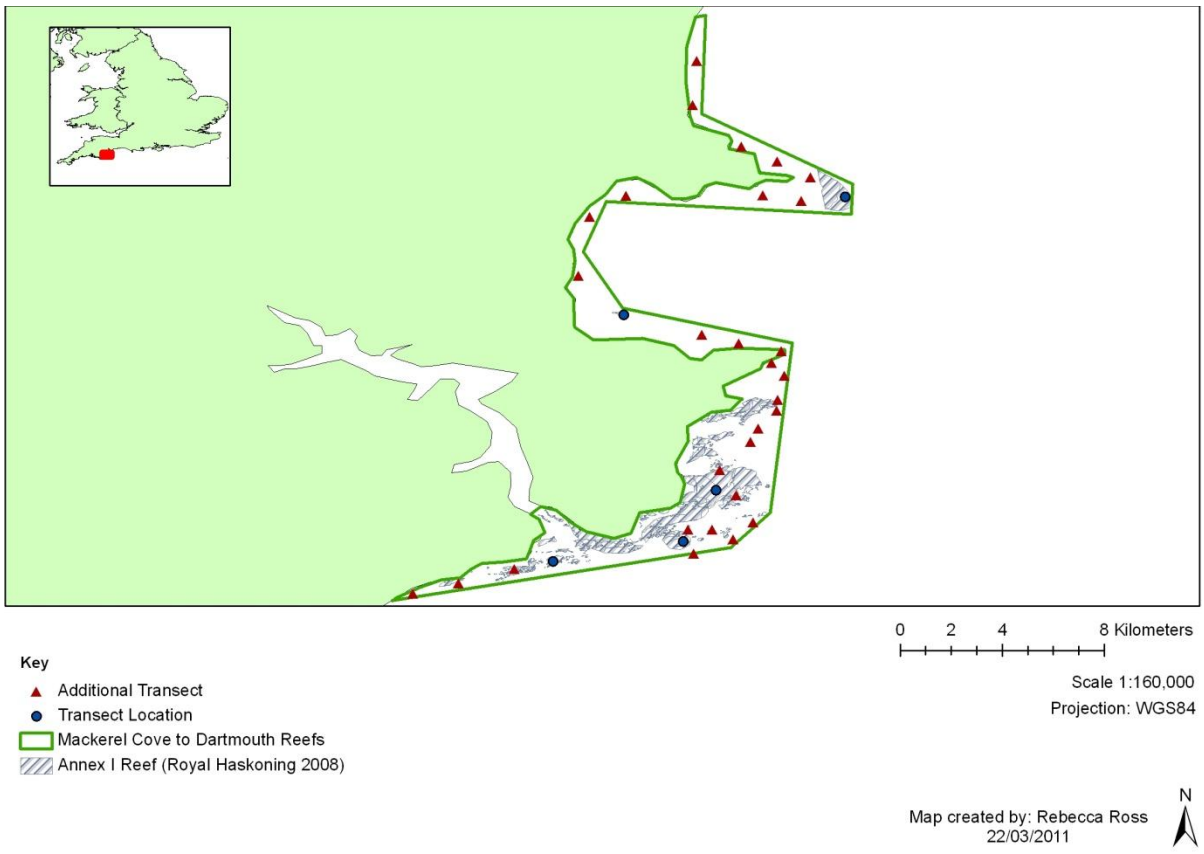


Figure 2 Additional Torbay transects

2.15 same vessel as was used during the Lyme Bay Monitoring Study. Due to the need to tow gear at such slow speeds transect locations and orientations were heavily influenced by tide and wind, and occasionally by fishing activity, but coordinates were adhered to as closely as possible.

2.16 HD video camera and CTD times and dates were synchronised before launching. The HD video footage at all times displayed this data along with transect name. All systems were set to record at time of launch, and the laser scaling system employed to aid later field of view measurements. The lasers were set at a distance of 17.6 centimetres apart.

2.17 The Flying Array system was deployed from Miss Pattie whilst stationary, waiting for the flying array and drop weight to reach the seabed before lifting to approximately 1m above the bottom, Figure 3 and Plate 2.

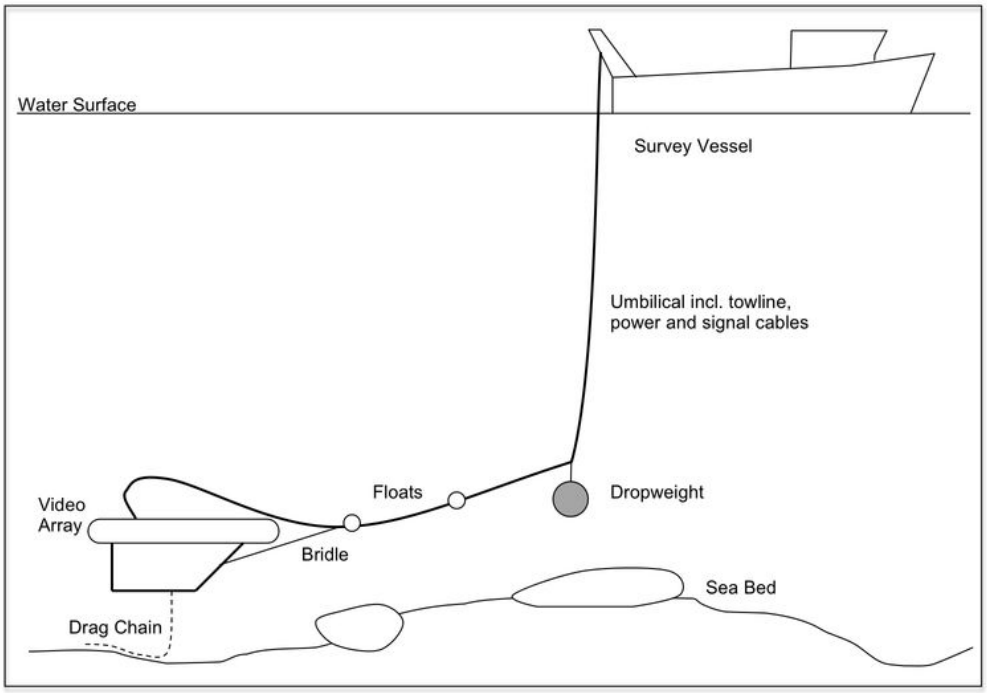


Figure 3 The Flying Array system, which flies over sea bed features with the drag chain keel as its only point of contact (after Sheehan, Stevens & Attrill 2010)

2.18 Time was given to the adjustment of focus and lighting before noting start time, along with depth and ship's GPS position. Due to lack of a USBL system the ships GPS position was manually noted every 2 minutes for the duration of the transect. As seen in the diagram above, the system is arranged so that the drop weight hangs almost vertically below the launch vessel, so lay back from GPS readings is approximately the length of cable between the drop weight and flying array which was set for the duration of the survey at 10m. Depth readings from Miss Pattie's sounder were also noted every 2minutes as a back up to the pressure readings recorded by the CTD.

2.19 The flying array was then towed at approximately 0.4knots for 200m as calculated from ship's GPS; the drop weight being occasionally raised and lowered to follow the bottom profile. Field notes were made throughout each transect to give a basic overview of the benthic landscape and provide operational notes for quick reference during the analysis procedure.

2.20 After 200m, the end time, GPS and depth were recorded, and the Flying Array hauled back on deck.

2.21 Stills images for quantitative analysis were obtained from an HD frame grabbing software, which generated high quality stills from the HD footage. This occurred during the analysis phase.

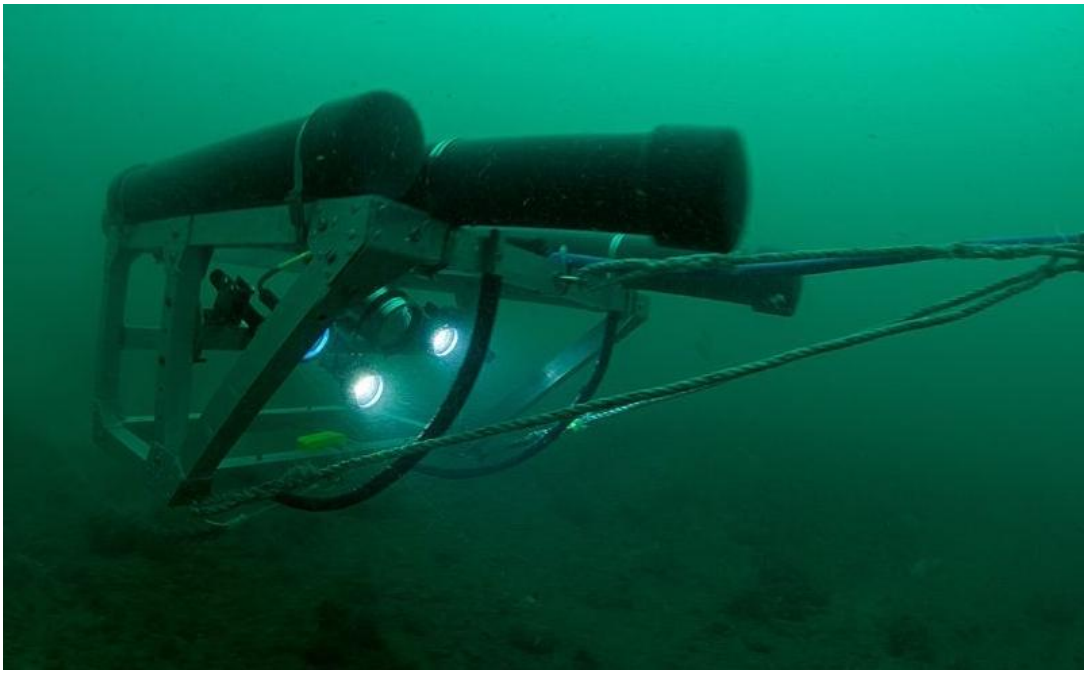


Plate 2 The Flying Array in action (after Sheehan and others 2010)

Analysis

2.22 After completion of fieldwork, the analysis was split into four phases:

i. Frame grab acquisition

ii. The quantitative analysis of frame grabs

iii. PRIMER analysis

iv. Biotope determination

Frame Grab Acquisition

2.23 For purposes of quantitative analysis, stills images had to be acquired from the HD video footage obtained in the field. This was done using a "3Dive Frame Extractor" software which had been commissioned by the Lyme Bay Monitoring Study from Cybertronix Ltd.

2.24 The software extracted a single 5MB image every 5 seconds from each HD video. Each extracted frame was also fitted with a quadrat overlay to aid in quantitative analysis.

2.25 These images were then "cleaned", removing all obscured or blurry images along with any image with an overly restricted or wide field of view (FOV). An appropriate FOV was considered to be between 30 cm^2 and 60cm^2 and was measured using laser positions relative to the quadrat overlay.

2.26 Ideally this FOV would have been larger; unfortunately, due to the time of year and proximity to soft substrate water visibility issues demanded the chosen scale.

2.27 Clean images were then lined up in tile form and 30 images spread as equally as possible over the duration of the transect were chosen at random to provide a 30 image sample of the transect. These images were then taken forward into the quantitative analysis phase.

Quantitative Analysis of Frame Grabs

2.28 For each of the 71 transects 30 clean representative images were analysed. An example image below, Plate 3, is shown for reference purposes.

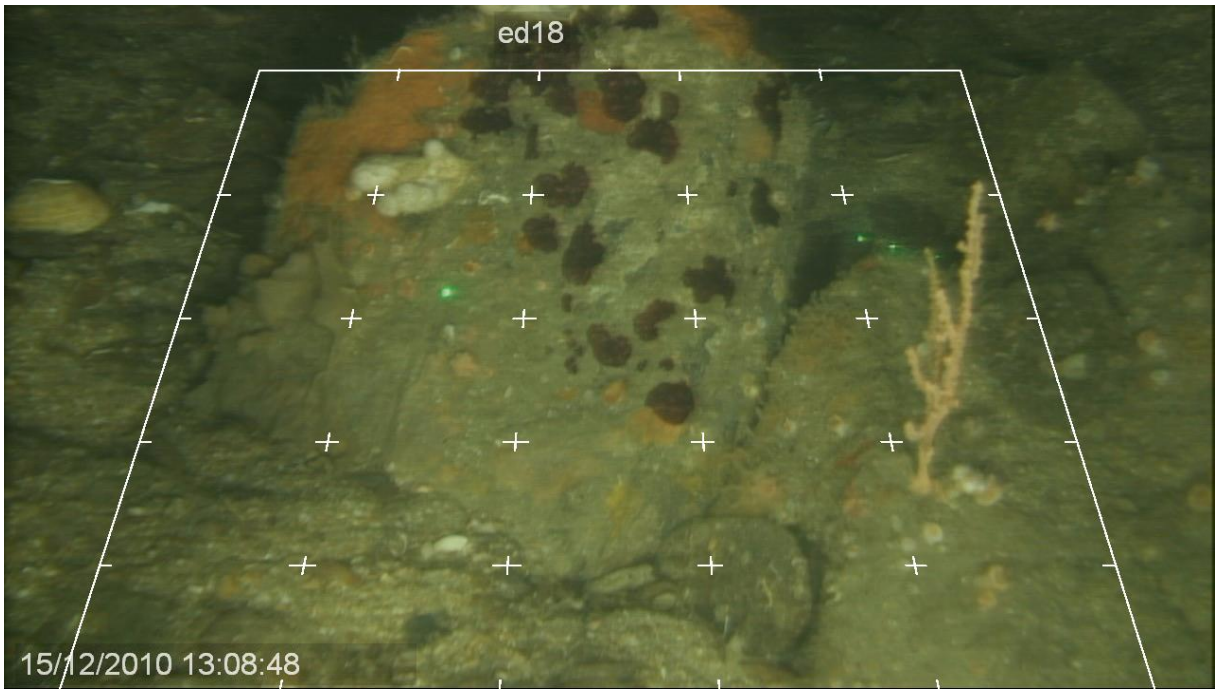


Plate 3 Example image for quantitative analysis. This is image number 12 from transect Ed18**.**

2.29 The date and time information recorded in the image overlay were used to first compile the CTD and USBL data that correspond with the image. The Flying Array image GPS readings had to be mathematically extrapolated from the nearest hand recorded ship coordinates.

2.30 The image FOV was assigned a value for later standardisation. Based on the lasers being at a set distance of 17.6 cm apart, the desired 30-60cm^2 FOV could be measured using the overlay quadrat grid-squares. To be within the required FOV the lasers would have to be between 1.5 and 3 grid-squares apart representing the 60cm^2 and 30cm^2 FOVs respectively. The example image above has a FOV of 2.5 quadrat boxes and therefore a field of view of approximately 35.2cm^2. Based on this system each image was assigned a value of 1.5, 2, 2.5 or 3 grid squares as a proxy for FOV.

2.31 An “FOV check” image chart can be found in Appendix Plate A in Appendix 3, and was used as a guide to judge the FOV of images with laser points missing.

2.32 The substrate was then recorded based on a modified Wentworth (1922) scale of grain size, adding secondary substrates to make the description more biologically relevant. Table 1 and Table 2 show the Wentworth Scale of particle grain size and the modified substrate codes and descriptions employed during this survey. The above example image was assigned the substrate code BCLS.

2.33 Benthic species within the quadrat overlay were then identified and their abundances recorded. Where cover forming organisms were encountered their percentage cover was calculated using the quadrat overlay. Species touching the quadrat were considered in. The following was recorded for the example image:

Eunicella verrucosa	1
Pomatoceros triqueter	6
Alcyonium digitatum	1
Caryophyllia spp.	17
Cellepora pumicosa	6%
Parasmittina trispinosa	6%
Hydroid Turf	4%

Table 1 Wentworth (1922) Scale of particle grain size

Term	Particle Size
Boulder	>256mm
Cobble	64-256mm
Pebble	4-64mm
Gravel	2-4mm
Sand	0.0625-2mm
Mud	<0.0625mm
Silt	0.0625mm-2µm
Clay	<2µm

Table 2 Substrate codes and descriptions as employed during this survey.

Substrate Code	Description
R	Rock: Bedrock
B	Rock: Boulders
BOS	Mixed substrate: Boulders
BCLS	Mixed substrate: Boulders & Cobbles
COS	Mixed substrate: Cobbles
PACOS	Mixed substrate: Pebbles & Cobbles
POS	Mixed substrate: Pebbles
G	Gravel
S	Sand

2.34 Any further noticeable features were also noted e.g. anthropogenic debris or influence, confidence levels, substrate detail, image quality, or noticeable species that did not lie within the quadrat.

2.35 This process was repeated for each sample image within all transects.

2.36 Image data were stored in excel for futher analysis. All image and transect data were entered into marine recorder.

PRIMER Analysis

2.37 Before statistical analysis the abundances were standardised for field of view as density per $0.5m^2$. Species density was then converted into effective percentage cover based on the observed 0-710 point field-of-view adjusted abundance count scale, so that abundance and cover data would be comparable for statistical analysis.

2.38 The combined percent cover and abundance dataset was analysed using PRIMER v.6 (Clarke & Warwick, 2001). Cluster analysis using group averaged linking was performed on a Bray-Crutis similarity matrix produced using square-root transformed data. The square-root transformation was chosen to add weight to those species of intermediate abundance whilst avoiding giving too much influence to rarer species. The fourth-root transformation gave too much weight to the rare species which is impractical when trying to identify broad-scale assemblages for biotope classification.

2.39 The SIMPROF routine was used to discern statistically significant clusters and SIMPER analysis employed to identify the characteristic species of each cluster.

Biotope Identification

2.40 Images in SIMPROF significant clusters were visually checked for similarity. Significant clusters of greater than 10 images and displaying visual similarity were considered potential biotopes. Comparison to the EUNIS database enabled biotope identification.

2.41 Video footage was then mapped using the biotopes identified from cluster analysis. Where an observed community could not be allocated to a biotope derived from cluster analysis biotopes were identified by eye.

3 Results

PRIMER Results

3.1 Of the 2040 images analysed, 1333 contained benthic fauna and were included in PRIMER analysis. Hierarchical cluster analysis showed images clustering by substratum type, Figure 4 , and by depth, Figure 5. Temperature varied throughout sampling but did not effect clustering, likely due to the large seasonal temperature range that fauna are subjected to especially in the infralittoral. Salinity did not vary greatly in spite of the proximity of some transects to the mouths of estuaries. No clusters grouped by salinity.

3.2 The first level cluster analysis is displayed on the following page with parent cluster groups collapsed. Clusters A-H were sub-divided into 45 subclusters using the SIMPROF routine in PRIMER v.6 at a significance level of 5%. Although all 45 clusters has statistically significant structure as determined by SIMPROF, visual inspection of those images belonging to neighbouring (and therefore related) clusters found many represented the same EUNIS biotope type and thus they were combined at a lower level of similarity. By way of illustrating this point the example dendrogram on the following page of the fine scale relationtionships between sub-clusters in partent cluster A shows sub-clusters AA and AB are dividing on the basis of depth. However, sub-cluster AB is further divided by the SIMPROF analysis into 2 further sub-clusters. Both of these sub-clusters of AB were dominated by *Ophiactis niger*, but the larger group displayed co-occurrence with other species. Assessment of the images from both clusters confirmed that all could be allocated to the EUNIS biotope **A5.445** [Ophiothrix fragilis] and/or [Ophiocomina nigra] brittlestar beds on sublittoral mixed sediment, thus AB was not further subdivided. SIMPROF analysis identified cluster FC as containing no significant internal structuring, thus statistically speaking it represented a single community.However visual inspection of the images contained within cluster FC revealed examples of more than one EUNIS biotope present within this cluster. Therefore cluster FC was further subdivided into 23 clusters. As a result of the mismatch between what were statistically significant clusters and what corresponded to exsitsing EUNIS biotope types, the cluster analysis was used to *guide* the identification and definition of biotopes observed.

3.3 A total of 13 biotopes were identified from rocky substrata, defined from the 68 sub-clusters. 27 clusters contained fewer than 10 images and were not considered further. 13 clusters were rejected as outliers; their constituent images visually defined as belonging to several different biotopes and further subdivision resulting in fewer than 10 visually similar images. All of these groupings occurring due to the intra-image over dominance of a single species. 6 clusters were soft sediment based and not considered further: the sampling techniques employed in this survey of annex 1 reef were appropriate to reef study alone as soft sediments contain infaunal communities which require appropriate grab sampling in order to assess biotopes.

3.4 9 clusters were visually defined as overlaps. Due to the small field of view, cluster affinity was often affected by differing species dominance within each image sample. Significantly differing clusters containing predominantly the same constituent species were visually assessed to affirm cluster overlap.

3.5 Examples of a coherent cluster, an overlapping cluster and an outlier cluster can be seen in Plate 4 Examples of coherent cluster FCP (A), overlapping cluster FCE which overlaps with cluster FCP (B) and outlier cluster FBD which cointains the *Lithophyllum sp* and *Pomateceros triqueter* dominant components of other clusters and biotopes.Of the 13 biotopes defined, 12 of these agreed with EUNIS classifications with 1 being potentially new.

3.6 Table 3shows the retained clusters and their sub-clusters along with their EUNIS designations.

3.7 All biotopes encountered are listed in Section 5 along with example images. More detailed EUNIS descriptions are available in Appendix 5.

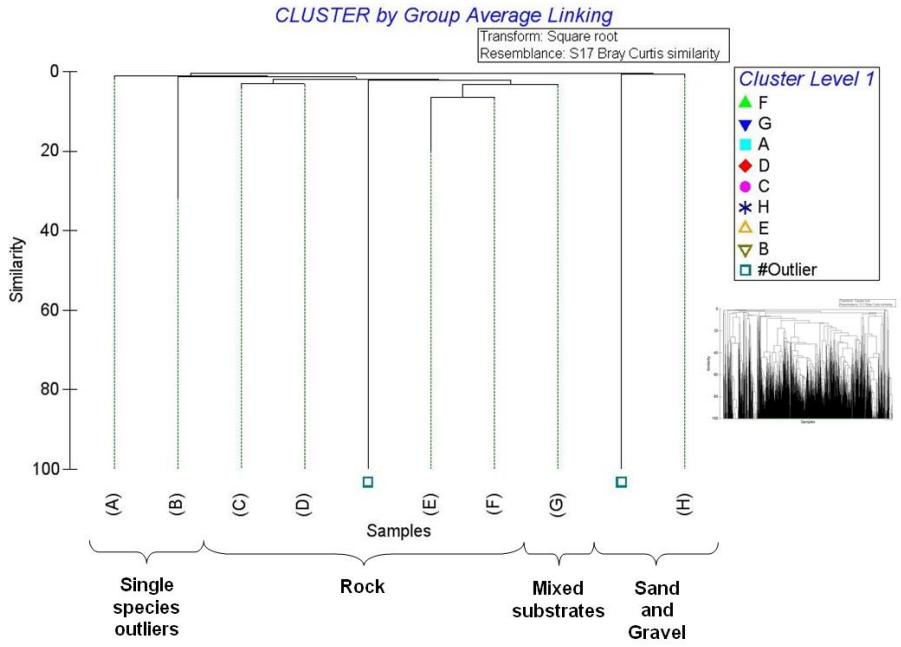


Figure 4 Cluster by group average linking. Clusters have been collapsed at a 6.5% similarity level for ease of viewing. First level clustering displayed grouping by substratum. Inset to the right shows the same dendrogram in un-collapsed form for demonstrative purposes

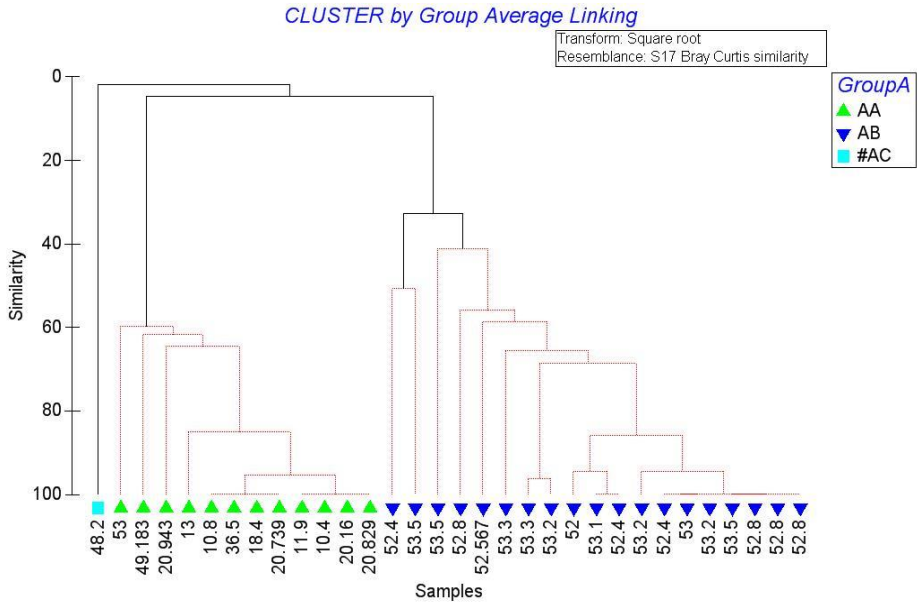
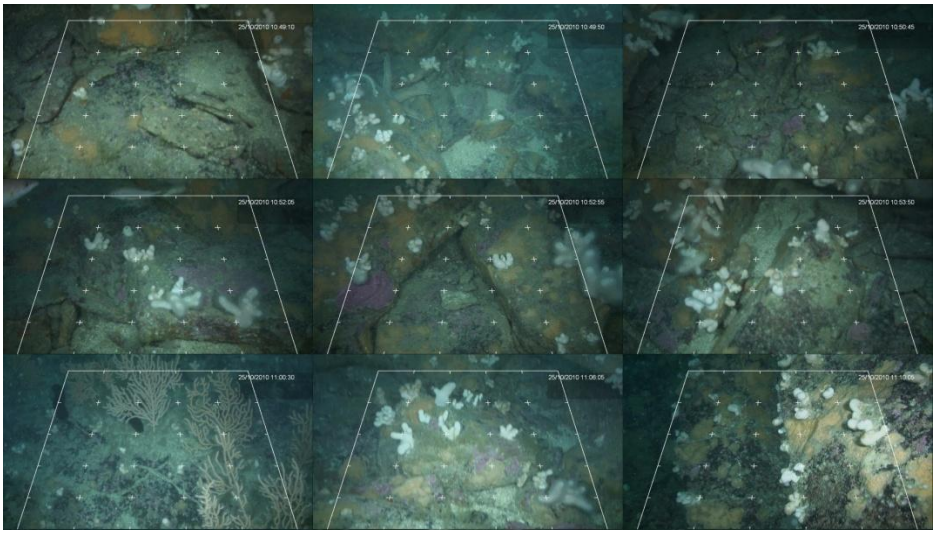
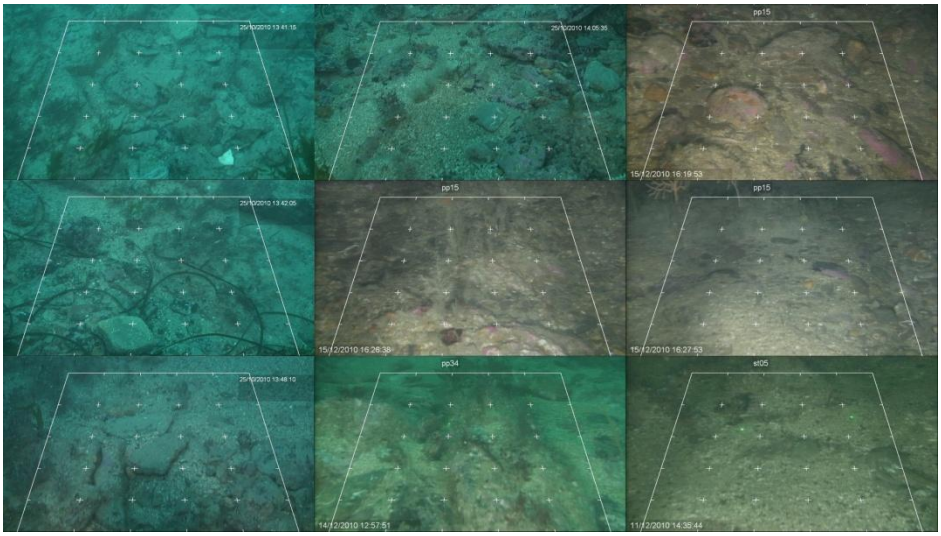


Figure 5 Clustering by depth in parent cluster A. Samples are labelled with their depth in metres. Sub-cluster AB is grouping by depth at approximately 52m. Groupings showing a SIMPROF 5 % significant clustering are marked with dotted lines



A

B



C

Plate 4 Examples of coherent cluster FCP (A), overlapping cluster FCE which overlaps with cluster FCP (B) and outlier cluster FBD which cointains the *Lithophyllum sp* and *Pomateceros triqueter* dominant components of other clusters and biotopes.

Table 3 EUNIS designations of retained clusters and their sub-clusters

EUNIS	Cluster	Sub-clusters	SIMPROF Descriptor Species	No. of Samples	No of Transects	Avearge no. of Samples per Transect	Transects with more than 3 images (outlier)	Depth	Sediment
A5.146	AA		*Pecten maximus*	11	8	1.375	mc08,	Mix Depth	Mix Sed
A5.4411	DE		*Halacium halecinum*	57	12	4.75	24ab, 25a, 26a, mc06,	40-50m	Predom POS
A4.2122	FAC		*Lithophyllum sp.* and encrusting sponges	14	4	3.5	pp15	20-30m	Rock
		FCC	Hydroid turf, *Lithophyllum sp* & *Parasmittina trispinosa*	23	10	2.3	pp15, (pp22), (pp29)	20m	Rock
A3.1161	FBA		*Didemnidae sp*. & *Dictyota membranacea*	62	10	6.2	pp13, pp22, pp26, pp28,	10-30m	Predom Rock
		FBE	*Lithophyllum sp.*, *Dictyota membranacea*, yellow encrusting porifera, *Alcyonium digitatum* & *Parasmittina trispinosa*	10	2	5	pp28, pp29	20m	Rock

Table continued…

EUNIS	Cluster	Sub-clusters	SIMPROF Descriptor Species	No. of Samples	No of Transects	Avearge no. of Samples per Transect	Transects with more than 3 images (outlier)	Depth	Sediment
		FCB	Hydroid turf, *Didemnidae sp.*, *Lithophyllum sp. & Dictyota membranacea*	12	5	2.4	pp29	10-20m	Rock
		GD	Algal turf, filimentous rhodophytes & dichotymous leafy phaeophyca.	13	4	3.25	pp13	20m	PACOS
A3.116	FBB		*Didemnid sp*, narrow branching rhodophytes & *Parasmittina trispinosa*	33	6	5.5	pp31, pp34	20m	Predom Rock
		CA	Narrow branching rhodophytes	23	5	4.6	pp31, st05,	10-20m	Predom Rock
A4.13	FAA		Hydroid and bryozoan turf	44	14	3.1429	21a, 27a, st01, st07,	10-60m	Rock
A4.132	FCH		*Corynactis viridis*, *Lithophyllum sp*, *Alcyonium digitatum & Parasmittina trispinosa*	40	7	5.7143	ed02, ed04, ed07, ed08, ed11,	30m	Rock
A4.132/A4.215	FCJ		*Alcyonium digitatum* dominant	14	4	3.5	pp19	20m	Rock
A4.1311	FCP (Combi)		*Parasmittina trispinosa*, *Alcyonium digitatum, Lithophyllum sp. & Eunicella verrucosa*	96	16	6	ed02, ed04, ed05, ed07, ed08, ed09, pp11, pp17, pp32,	20-40m	Rock

Table continued…

EUNIS	Cluster	Sub-clusters	SIMPROF Descriptor Species	No. of Samples	No of Transects	Avearge no. of Samples per Transect	Transects with more than 3 images (outlier)	Depth	Sediment
		FAB	Hydroid and bryozoan turf, *Alcyonium digitatum*, *Eunicella verrucosa* & *Parasmittina trispinosa*	24	12	2	ed05, ed07,ed18, pp17	20-60m	Rock
		FCE	Hydroid turf, *Parasmittina trispinosa* & *Alcyonium digitatum*	71	20	3.55	ed04, ed08, ed16, ed18, mc08, pp16, pp17, pp22, pp29, pp32	Mixed Depth	Rock
		FCT	*Cellaria fistulosa*, *Alcyonium digitatum*, erect branching sponges & *Nemertesia antennina*	12	4	3	pp11, pp16	>20m	Rock
		FCU	*Alcyonium digitatum*, *Eunicella verrucosa* & *Parasmittina trispinosa*	26	11	2.3636	ed08, ed09, pp10, pp11, pp17	>30m	Rock
A5.141	GG		*Pomatoceros triqueter* dominant	86	24	3.5833	12a, 20a, 5a, ed04, ed18, mc01, mc08, pp03, pp06, st01, st08, st15	Mix Depths	Mix Rocky
A3.12	CCA		*Asterias rubens* & *Mytilus edulis*	8	2	4	12a	10m	Rock
A5.431	GE		*Crepidula fornicata*, *Pomatoceros triqueter* & *Turritella communis*	23	1	23	mc01	30m	Sand

Table continued…

EUNIS	Cluster	Sub-clusters	SIMPROF Descriptor Species	No. of Samples	No of Transects	Avearge no. of Samples per Transect	Transects with more than 3 images (outlier)	Depth	Sediment
A5.445	GI		*Pomatoceros triqueter* & dense *Ophiocomina niger*	16	2	8	st13	50m	PACOS
		GJ	*Ophiothrix fragilis* & *Urticina felina*	20	6	3.333333333	pp06	50m	Rock

Mapping the HD Video

3.7 Using the biotopes identified above, the HD video was reviewed and classified. This confirmed the presence of the biotopes in each transect whilst also identifying any further biotopes that were not apparent from the sample image analysis.

3.8 Four further EUNIS biotopes were identified from video mapping. Pp22 and pp24 supported A4.213 [Urticina felina] and sand-tolerant fauna on sand scoured or covered circalittoral rock ; ed02 supported A3.113 [Laminaria hyperborea] forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock; ed11 and ed16 hosted A4.12 sponge communities on deep circalittoral rock; and transect 9a supported A5.53 sublittoral seagrass beds. Transect 9a was omitted from image analysis due to very poor visibility and no further detail was available to classify this biotope further. In spite of being a soft substrate biotope, it is included here for its conservation interest.

3.9 Where soft sediments were encountered they were mapped to substrate type only. Any further biotope assessment of these communities should be made using appropriate sampling techniques.

3.10 The result of the video mapping was a GIS point shapefile, where each trasect was mapped according to their component biotopes allowing the extent of each biotope within and among transects to be assessed. These GIS layers accompany this report and mapped transects can be seen in Appendix 7.

3.11 Further evaluation of biotope extent can then be extrapolated in the future making use of acoustic data to predictively map the biotopes to corresponding features and conditions, as encountered in the sample transects.

3.12 A biotope photo list is available in chapter 5 with further details and a list of biotopes encountered by region found in Appendix 5.

4 Discussion

4.1 Here find a description of each of the four regions surveyed during this contract, along with comparison to the descriptions given in the ITT obtained for pSAC assesement. The original paragraph descriptions from the ITT are also included for quick reference.

Plymouth Sound to Prawle Point Reefs

Prawle Point to West Rutts reefs

The Prawle Point to West Rutts reefs is a relatively large area with a topographically diverse array of reefs. Many nationally rare or scarce species such as the algae *Carpomitra costata*, the pink sea fan *Eunicella verrucosa*, and the corals *Leptopsammia pruvoti* (sunset cup coral), *Hoplangia durotrix* (carpet coral) and *Caryophyllia inornata* have been recorded, as well as a wide variety of species typical of both cold- and warm-water environments. The East Rutts reefs provide a habitat for a distinctly different range of dominant species, probably because the reefs are composed of limestone. Here, the seabed is visually dominated by the antenna hydroid *Nemertesia antennina* but there are areas with abundant *Securiflustra securifrons* which is unusual along this coast. The polychaete *Phyllochaetopterus anglicus* is common in overhangs and the bored rock provides additional habitats for a wide variety of other species. The area is also known for having a high abundance of football sea squirts *Diazona violacea*.

Bigbury Bay to Plymouth Sound reefs

The Bigbury Bay to Plymouth Sound reef area is an extensive area of outcropping bedrock reef characterised by rugged inclines, steep faces, slate ridges and overhangs. Shallow parts of these reefs are dominated by algae including extensive kelp forests whilst, below a depth of about 20m, faunal communities predominate. Reefs are broken, with shale reefs especially having extensive overhangs. The submerged cliff line at between about 25m and 35m below chart datum and about 2km south of the Plymouth Sound breakwater, is a geological feature that provides an important habitat for many rare and scarce species as well as being spectacularly colourful (Hiscock & Breckels, 2007). The Bigbury Bay to Plymouth Sound reefs exhibit topographic complexity, with pinnacles, boulder fields and complex broken geological features being frequently recorded. Analysis has been carried out by the Ntural England reef evidence panel, of more recent digital survey bathymetry dataset (Seazone solutions, 2010) which allowed validation of previously mapped reef habitat.

Prawle Point to West Rutts Reefs

4.2 The predominantly circalittoral reefs between Prawle Point and West Rutts are dominated by the *Eunicella verrucosa* and *Pentapora foliacea* biotope. This biotope tends to be seen on reefs with a fine sediment overlay which hosts the cup coral *Caryophillia sp.*Exposed rock often displaying encrusting bryozoa and sponges.

4.3 Around the drop-off the *Eunicella verrucosa* is very dense with a heavy silt overlay on the rock. Many of the fans were fouled with organisms such as hydroids, bryozoans and the ascidians *Pycnoclavella aurilucens* and *Diplosoma listerianum.* Occasional *A.digitatum* interspersed.

4.4 *Ophiothrix fragilis* and *Ophiocomina niger* beds are also found in this area, these brittlestars often lying so thick on the ground you cannot see the substrate. The Dhalia Anemone *Urticina felina* can often be found amongst them, while predatory echinoderms such as *Luidia ciliaris* and *Crossaster poppalus* may be seen as islands as they are given a wide berth. Rock out croppings tend to host the abundant *A.digitatum* here accompanied commonly by the Plumose Anemone *Metridium senile* and the Antenna Hydroid *Nemertesia antennina*.

4.5 Closer to the infralittoral red algae are found in abundance, frequently encrusted with Didemid ascidians. Intermittant Elephant Hide *Pachymatisma johnstonia*, Shredded Carrot *Esperiopsis fucorum,* Massive Yellow Boring *Cliona celata,* and erect branching sponges may be encountered. Sediment overlayed rocks are regularly covered with bryozoans such as *Cellaria fistulosa* occasionally hosting *Caryophyllia sp* and displaying colourful encrusting sponges and bryozoans wherever the rock is exposed. Echinoderms *M.glacialis* and *E.esculenta* are the most common.

4.6 Where *Echinus esculentis* is common, the reef tends to take on a more grazed appearance. Abundant *A.digitatum* prosper while hydroids, bryozoans and encrusting organisms are kept low lying and infrequent. Transect pp19 displays a variation on this them where the reef is dominated by *A.digitatum* and the Jewel Anemone *Corynactis viridis* whilst still displaying rich, yet low-lying patches of red algae, bryozoans and hydroids, especially the Indian Feather Hydroid *Gymnangia montagui*. Massive *C.celata*, *E.fucorum* and *P.johnstonia* and occasional *P.foliacea* offer noticable protrusions. Echinoderms are abundant, particularly *E.esculenta*, but also *Asterias rubens*, *M.glacialis* and *C.poppalus*. Reef peaks are covered in *Tubularia indivisa*.

4.7 One coarse sand transect in this region displayed an abundant population of the Queen Scallop *Aequipecten opercularis*.

Bigbury Bay to Plymouth Sound Reefs

4.8 These inshore reefs are predominantly infralittoral. Mixed red algae and the macrophytes *Dictyota dichotoma* and *Dictyopteris membranacea* dominate with abundant colonies of a didemnid ascidian attached to the algae and the substrate. Frequent hydroids and dead man's fingers Alcyonium Digitatum may be seen along with occasional *Polymastia boletiformis*, *Tethya aurantium* and *Cliona celata* sponges which punctuate the green. The echinoderms *Marthasterias glacialis*, *Holothuria forskali* and *Echinus esculenta*.

4.9 In the circalittoral areas the rock tends to be heavily encrusted with sponges, the calcareaous algae *Lythophyllum*, and bryozoans such as *Parasmittina trispinosa* and *Cellapora pumicosa*. Massive, erect and cushion sponges such as *C.celata, Halichondria oculata* and *P.boletiformis* respectively can be seen, with frequent *A.digitatum, Caryophyllia sp.* and low lying hydroids. Echinoderms remain the same with the addition of *Henricia sanguinolenta*. Occasional Ross Corals *Pentapora foliacea* and Pink Sea Fans *Eunicella verrucosa* may also be seen indicating potential proximity to their ubiquetous South Western A4.1311 biotope.

4.10 Where the rock flattens out and is patchily covered with coarse sand, scour-tolerent fauna are seen. The anemone *Urticina felina* is often accompanied by the Pencil Sponge *Ciocalypta penicillus* poking through the sand, while exposed rock outcroppings, boulders and cobbles are heavily enrusted with *Lithophyllum* and *P.trispinosa*.

4.11 Two Foot ball Sea Squirts *Diazona violacea* were seen in this area.

Eddystone reefs

"The Eddystone Rocks which lie some 20 km south of Plymouth Sound (Davies, 1998), are Devonian in age and consist of schist, siltstone and limestone (BGS, 1996) with flat-faced, angular vertical cliffs and overhangs (Irving, 1996). The Eddystone and surrounding reefs represent unusual features within the study area in that they lie in deep water and rise steeply, and in the case of the Eddystone, break the water's surface. The seabed sediments in the Eddystone Reefs area exhibit a range of deposits, from coarse muddy sand to fine gravel and shelly gravel immediately around Eddystone Rocks (Holme,1953). The area has been subject to detailed investigations commissioned by Natural England in 2005, with a view to assessing the site's potential for supporting Annex I habitat. Surveying has shown the habitat to be fragmented, consisting of five reefs (Eddystone reef, Hand Deeps, Middle Rock, Phillips Rocks and Hatt Rock (Axlesson *et al*, 2006)). Although the individual reefs are relatively small (both on a national and local scale), they are ecologically diverse and represent a locally significant area (in terms of their size) of permanently submerged, offshore reef habitat."

4.12 The Pink Sea Fan *Eunicella verrucosa* and Ross Coral *Pentapora foliacea* A3.1311 biotope dominates the Eddystone Reef transects. This biotope often occurred when the underlying rock was overlaid with a fine layer of sediment. Dominant understorey species were Dead Man's Fingers *Alcyonium digitatum* and cup corals *Caryophyllia spp* along with *Parasmittina trispinosa* and *Parsmittina trispinosa.* Occasional *Cliona celata,* erect branching sponges, and the erect bryozoan *Porella compressa* were also seen.

4.13 The majority of *E. verrucosa* was found standing although a sizeable portion of these were fouled with other organisms such as hydroids, bryozoans and the ascidians *Pycnoclavella aurilucens* and *Diplosoma listerianum.* The pink sea fan anemone *Amphianthus dohrnii* was also seen occasionally.

4.14 Deeper transects displayed the A4.12 sponge communities on deep circalittoral rock biotope which is dominated by erect branching sponges with occasional *E.verrucosa* and *P.foliacea* interspersed throughout.

4.15 The reef top on transect ed02 gave way to a *Laminaria hyperborea* forest which was accompanied by a *Dictyota dichotoma* and *Dictyoperis membranacea* understorey with Jewel Anemones *Corynactis viridis*, indian feather hydroids *Gymmnangium montagui,* and cushion sponges such as *Cliona celata* and *Pachymatisma johnstoni* interspersed.

4.16 Exposed rock was covered in biotope A4.132. Very abundant Jewel Anemones *Corynactis viridis*, and Dead Man's Fingers *Alcyonium digitatum* dominated the area with frequent hydroids, bryozoans and encrusting organisms such as the byozoans *Parsmittina trispinosa*, *Cellepora pumicosa*, and encrusting coralline algae *Lithophyllum sp.* Occasional sponges such as *Polymastia boletiformis*, massive forms of the Yellow Boring Sponge *Cliona celata,* erect branching sponges, and the erect bryozoan *Porella compressa* were also seen along with the soft coral Red Fingers *Alcyonium glomeratum.* The echinoderms *Echinus esculanta*, *Holothuria forskali,* and *Marthasterias glacialis* were often seen, with occasional appearances from *Henricia sanguinolenta, Aslia lefevrei, Anseropoda placenta* and *Porania pulvilus.*This biotope often overlapped with the *Eunicella verrucosa* A3.1311 biotope.

4.17 Occasionally upward facing shelves of Chaetopterid polychaete communities were seen, but not covering large enough areas to be considered as distinct biotopes in themselves.

4.18 Between bedrock reefs, boulders and unstable cobbles and pebbles sometimes hosted *Pomatoceros triqueter* and *P. trispinosa.*

Prawle Point to Start Point reefs

The reefs between Prawle Point and Start Point exhibit many of the same characteristics as the reefs to the west of Prawle Point. They have a high level of topographic and biological diversity, and support many species, including some nationally rare or protected species. Around Lannacombe Bay and Start Point, the reefs consist of slate bedrock reef and steep cliff faces and have areas of very high tidal streams in the shallower waters. Although the area is still generally of the Eunicella-Pentapora biotope, there are higher numbers of erect branching bryozoans and antenna hydroids than there are on the reefs between Salcombe and Plymouth. Brittlestars (*Ophiocomina nigra*) are also more frequently found, and common mussel (*Mytilus edulis*) beds have been recorded in the inshore areas of Start Point. Diver surveys have recorded a number of key species that are typically associated with defined reef habitat including algaes (*Alaria esculenta, Laminaria hyperborea, Laminaria saccharina*), soft coral (*Alcyonium digitatum*), stony coral (*Carophylia smithii*), bryozoans (*Flustra folicicea, Alcyonidium diaphanum*), and hydroids (*Tubularia spp.*).

4.19 Around Prawle Point the currents are very fast and reef pinnacles were seen covered in the filter-feeding crinoid *Antedon bifida*. A mixed faunal turf of which Dead Man's Fingers *Alcyonium digitatum* are the most ubiquetous, often accompanied by dense bryozoan *Cellaria fistulosa* carpets with *Caryophyllia inornata* occupying crevices.

4.20 An *Ophiothrix fragilis* bed overlies sand scoured rock in this area, with the Dhalia anemone *Urticina felina* appearing as frequent islands in the sea of brittlestar arms. Rock outcrops host the abundant *A.digitatum,* the Plumose Anemone *Metridium senile* and Antenna Hydroid *Nemertesia antennina.*

4.21 Start Point was unique amongst survey transects displying gravel dunes with underlying bedrock and hosting a diverse assemblage of scour-tolerant fauna. Multiple cushion sponges including *Hemimycale columella* and *Haliclona viscosa,* and the Dhalia *U.felina* and Elegant *Sagartia elegans* anemones, provide a colourful carpet. Antenna hydroid N.*antennina* and clumps of Hornwrack *Flustra foliacea* are often encountered, along with the usual *A.digitatum*. The bryozoans *C.fistulosa* and *Caberea ellisii* are also common, and the painted top shell *Calliostoma zizyphinum* frequently seen. These were the most visually distinct variations of biotopes seen elsewhere.

Mackerel Cove to Dartmouth Reefs

The Torbay region of the survey area included transects undertaken as an addendum to this contract with the purpose of speculatively locating Stoney Annex1 reef in this pSAC. As such the majority of Torbay transects were not on annex1 reef and many of these could not be included in the image analysis portion of this survey due to the soft substrate and consequential poor visibility encountered. As this survey was designed for the sampling of hard substrates the transects which encountered sediment based habitats with appropriate visibility were also ignored during analysis as biotope identification would also require infaunal sampling. One of these transects encountered a soft substrate sea grass bed, which due to poor visibility was not included in analysis. However as this was identified as of conservation importance, it was retained in video analysis, although solely as this parent biotope

Mackerel Cove to Dartmouth reefs

The reefs in the Mackerel Cove to Dartmouth area exhibit great geological variety. Between Dartmouth and Scabbacombe Head slate reef is present with occasional granite outcrop. The slate reefs represent complex topographic features characterised by steeply inclined bedrock rising vertically with deep gullies. The reefs present between Crabrock Point and Sharkham Point are formed from mud ledges which form 2m high rock ridges. The reef features surrounding Berry Head principally comprise limestone ridges, boulders and pinnacles. The complex reef features, including ridges, vertical drop-offs, pinnacles and deep gullies, support rich species assemblages. Within Torbay, the reefs comprise discrete areas associated with the many headlands and coves (and include from south to north: Brixham to Ivy Cove reefs, Churston Point, Armchair Rock, Roundham Head and Hollicombe rocks to Livermead sands). The reefs in Torbay have a more diverse composition with limestone outcrops recorded in the southern half of the bay, and sandstone in the upper half of the bay. Hope's Nose reef (including Thatcher Rock and the Ore Stone) are large areas of limestone reef extending around the northern headland of Torbay.

4.22 Between Mackerel Cove and Berry Head stony reef was encountered. Cobble substrate was host to the abundant Slipper Limpet *Crepidula forncata* interspersed with Herringbone Hydroids *Halecium halecium* and Snakelocks Anemones *Anemonia viridis*. The Turret Shell *Turritella communis* is often seen, while the Keel Worm *Pomatoceros triqueter* encrusts the cobbles.

4.23 Annex 1 bedrock reef in the Torbay region was predominantly concentrated in the Berry Head to Dartmouth portion of the survey area. Shallow reefs displayed signs of macroalgae including kelps but bad visibility and seasonal algal paucity prevented full biotope identification. These areas often apeared sand scoured and supported abundant Mussells *Mytilus edulis* and Common Starfish *Asterias rubens.*

4.24 Close to Berry head the current was strong and reef pinnacles were occupied by dense popultions of the crinoid *Antedon bifida*. Below these Dead Man's Fingers *Alcyonium digitatum* and dense bryozoan *Cellaria fistulosa* carpets create a mixed faunal turf with *Caryophyllia inornata* occupying crevices. Occasional patches of exposed rock hosted encrusting sponges, bryozoans and Didemnid ascidians.

4.25 Areas of unstable cobbles and pebbles tend to host only the Keel Worm *Pomatoceros triqueter* with occasional turbulance tolerant encrusting organisms.

4.26 Soft substrate communities in this region appeared to include amongst their epifauna: echinoderms the Common Starfish *A.rubens* and the Long-legged Brittlestar *Ophiura ophiura*, gastropods the Turret Shell *T.communis* and Whelk *Buccinium undatum*, bivalves the King Scallop *Pecten maximus* and the Queen Scallop *Aequepecten opercularis*, and crustaceans the Hermit Crab *Pagurus spp* and the Mud Runner *Liocarcinus depurator* whose burrows are often apparent.

5 Species and Communities

Species and Biotope Lists

Species

5.1 Target species to look out for were identified using the ITT and preliminary SAC assessment literature. The target species list for the Lyme Bay Monitoring Study was also employed as a guideline, assuming similar species would be present, especially in the Torbay region. These were species identified as important indicators for recovery, with the addition of nationally rare species and any additional species considered to be of conservation interest.

5.2 50 target species were identified of which 16 were not encountered during analysis. 2 of these were from the lyme bay species list: *Phallusia mammillata* the giant sea squirt, is possibly not found in the survey area, while *Homarus gammarus* the common lobster is probably present in the survey area but was not encountered during the survey.

5.3 The remaining 14 target species not encountered were identified in the SAC assessments. These species are all likely present but either not encountered, rare, or were subject to poor taxonomic resolution when seen. Predominantly Phaeophyca and Rhodophyta species from this list may have been encountered but identified only to morphospecies resolution.

5.4 A total of 136 identification units were employed throughout the survey. This included:

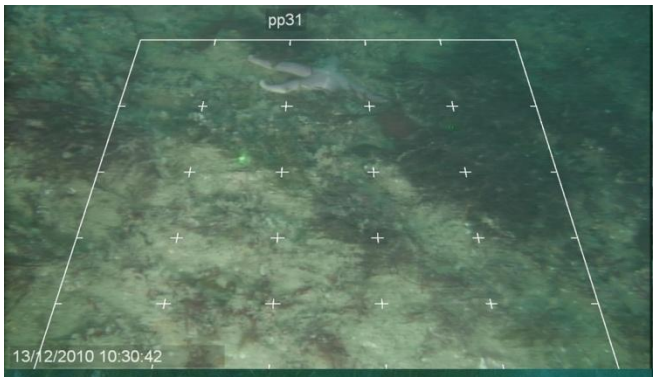
- 120 animals identified to genus or species level,
- 3 Phaeophyca morphotypes,
- 3 Rhodophyta morphotypes,
- 3 classifications of turf,
- 2 types of nudibranch egg clusters, and
- 4 colour-based morphotypes of encrusting Porifera.
- As the Lyme Bay Monitoring Study recommended, all erect branching sponges were included as a single morphotype, as identification to species level by video and image analysis was considered unreliable.

5.5 The full species list including Lyme Bay and SAC assessment target species is available in Appendix Table B **List of target and encountered species ordered by Phylum or Class and listed alphabetically.**. A photo catalogue of all identification units employed during this survey will be included with the deliverables accompanying this report. Appendix 4 also contains an alphabetical species list by region as identified from the images.

Biotopes

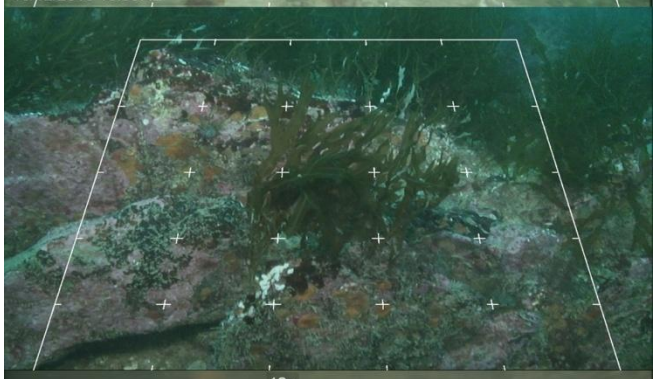
5.6 Here follows a list of encountered biotopes: 13 as defined by PRIMER, and 4 subsequently defined by eye during the mapping of the video.

Biotopes defined by PRIMER CLUSTER analysis



A3.116

Foliose red seaweeds on exposed lower infralittoral rock



A3.1161

Foliose red seaweeds with dense [Dictyota dichotoma] and/or [Dictyopteris membranacea] on exposed lower infralittoral rock

A3.12

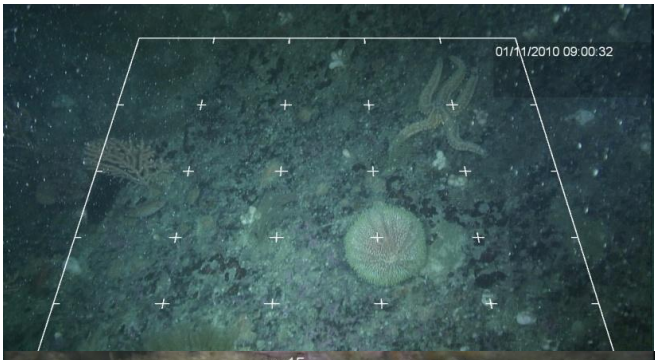
Sediment-affected or disturbed kelp and seaweed communities

A4.13

Mixed faunal turf communities on circalittoral rock

A4.1311

[Eunicella verrucosa] and [Pentapora foliacea] on wave-exposed circalittoral rock

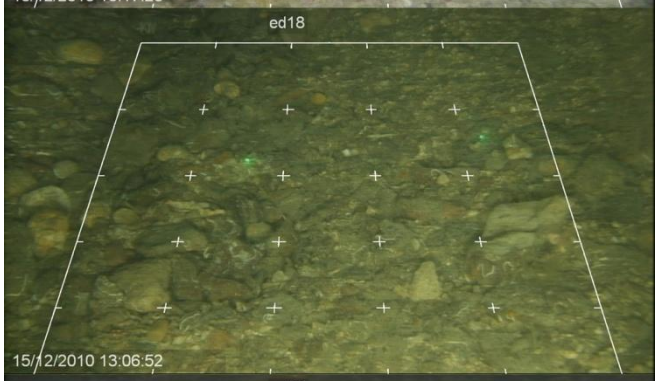


A4.132

[Corynactis viridis] and a mixed turf of crisiids, [Bugula], [Scrupocellaria], and [Cellaria] on moderately tide-swept exposed circalittoral rock

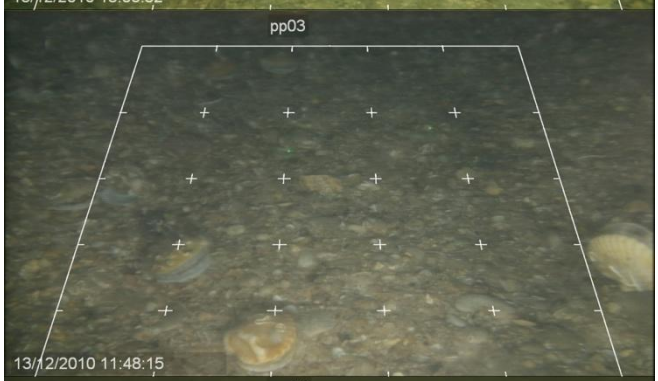
A4.2122

Caryophyllia smithii] and sponges with [Pentapora foliacea], [Porella compressa] and crustose communities on wave-exposed circalittoral rock



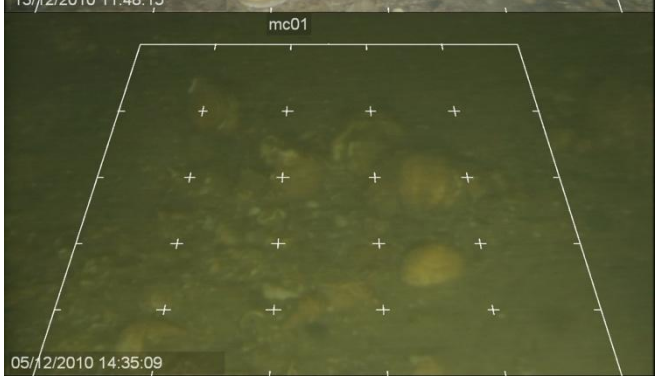
A5.141

[Pomatoceros triqueter] with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles



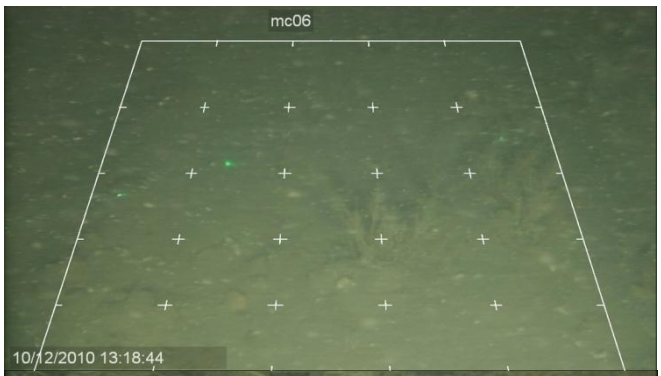
A5.146

Scallops on shell gravel and sand with some sand scour



A5.431

[Crepidula fornicata] with ascidians and anemones on infralittoral coarse mixed sediment



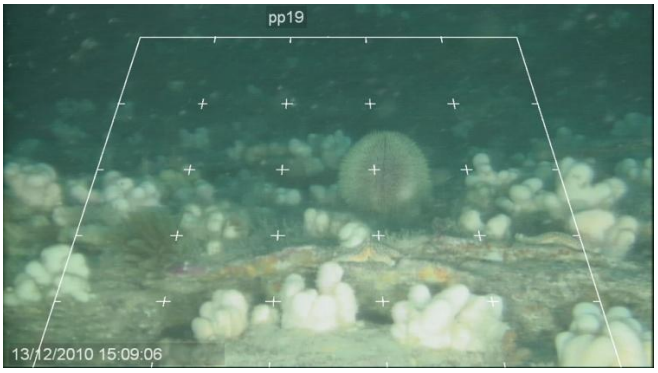
A5.4411

[Cerianthus lloydii] with [Nemertesia] spp. and other hydroids in circalittoral muddy mixed sediment

A5.445

[Ophiothrix fragilis] and/or [Ophiocomina nigra] brittlestar beds on subblittoral mixed sediment

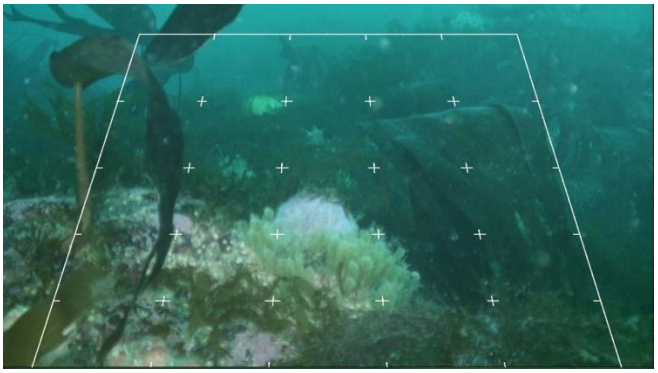
Biotopes which vary from EUNIS classifications as defined by PRIMER



Cluster FCJ Potential transitional biotope
From **A4.132**
[Corynactis viridis] and a mixed turf of crisiids, [Bugula], [Scrupocellaria], and [Cellaria] on moderately tide-swept exposed circalittoral rock

To the *Echinus esculentis* grazed **A4.215** [Alcyonium digitatum] and faunal crust communities on vertical circalittoral bedrock.

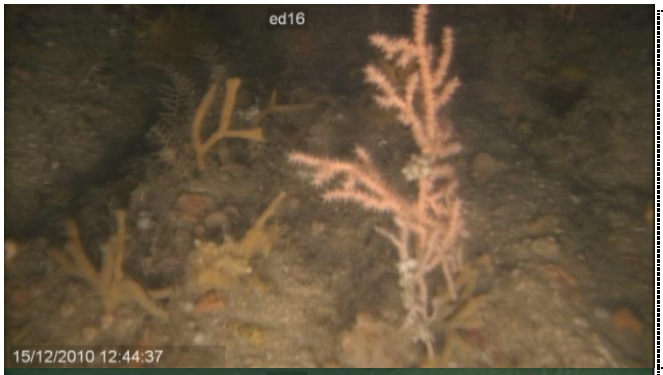
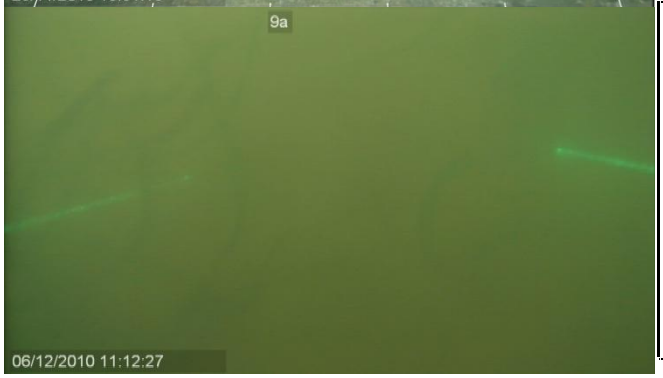
Biotopes which were defined by eye from the video



A3.113

[Laminaria hyperborea] forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock

Primarily seen in transet ed02

	**A4.12** Sponge communities on deep circalittoral rock As seen in transects ed11 and ed16
	**A4.213** [Urticina felina] and sand-tolerant fauna on sand-scoured or covered circalittoral rock Primarily seen in transects pp22 and pp24 with interesting variation in st01.
	**A5.53** Sublittoral seagrass beds Seen in transect 9a which was omitted from image analysis due to very poor visibility.

5.7 Further details of each biotope are available in Appendix 5, along with their corresponding JNCC Marine Habitat Classification for Britain and Ireland codes.

Notable Species and Communities of Conservation Interest

5.8 The target species list is probably the best indicator of known and potential species of conservation importance in this area. The criteria for their selection required they be nationally rare, of conservation interest, of commercial importance, or good indicators of recovery. Target species are indicated in the list provided in Appendix 4, and any species designated as important to the UK Biodiversity Action Plan or considered Nationally Rare or Scarce are also indicated. Plate 6 shows a few species of interest as seen from the survey video.

5.9 Of primary interest in South Devon is the Pink Sea Fan *Eunicella verrucosa* which here is at the northern-most extent of its range. It is considered a nationally important species which, as a beautiful gorgonian of great interest to divers, is also delicate and slow growing making it particularly susceptible to damage. Subsequently it is also a good indicator of community disturbance.

5.10 *E.verrucosa* also supports other species such as the pink sea fan anemone *Amphianthus dohrnii* which was visible on sea fans in Eddystone. Plate 5 shows two Pink Sea Fans *E.verrucosa*, with a Ross Coral *Pentapora foliacea* as seen in transect ed07. The left hand sea fan has *A.dohrnii* attached to a frond just above *P.foliacea.* An inset image shows *A.dohrnii* in close up (Hiscock).

5.11 The *Eunicella verrucosa* and *Pentapora foliacea* A4.1311 biotope is consequentially the main community of conservation interest.

5.12 Also considered to be of conservation interest, whilst being outside of the remit of this Annex1 reef survey, is the sublittoral seagrass bed seen in transect 9a. As seagrass beds are widely accepted as a nursery habitat for a number of species, this community is also mentioned here for thoroughness and because it is situated within the Torbay pSAC survey area.

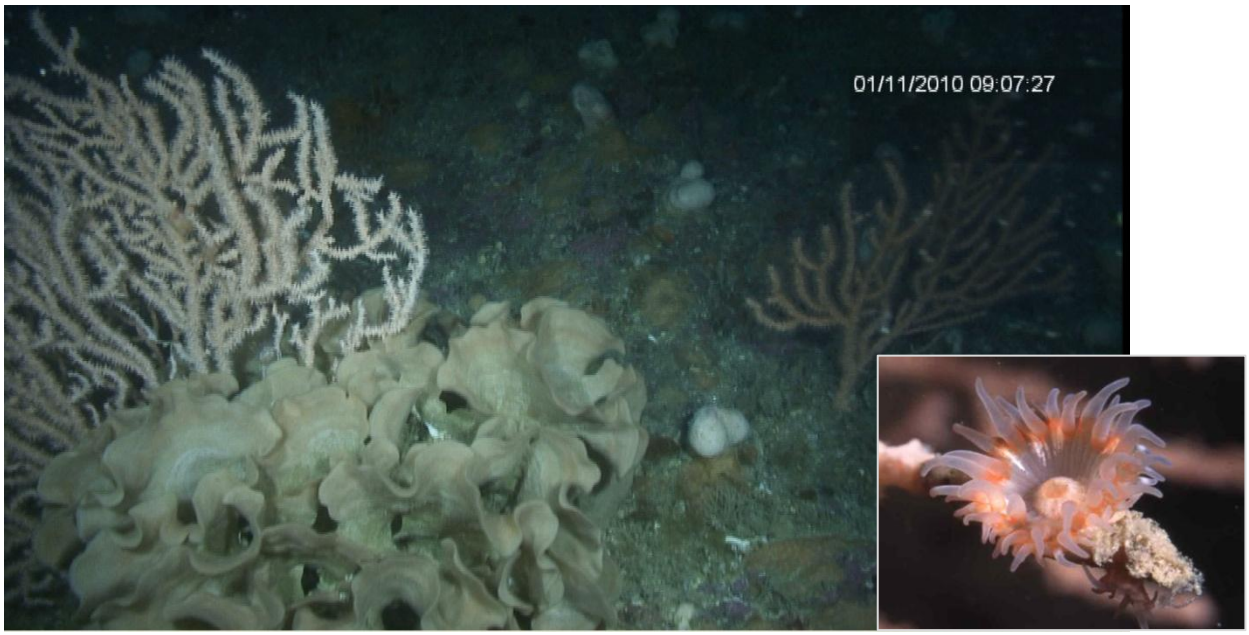


Plate 5 *Eunicella verrucosa* and *Pentapora foliacea* in eddystone. *Amphianthus dohrnii* may be seen on the left hand sea fan, a close up is provided in inset (Hiscock).

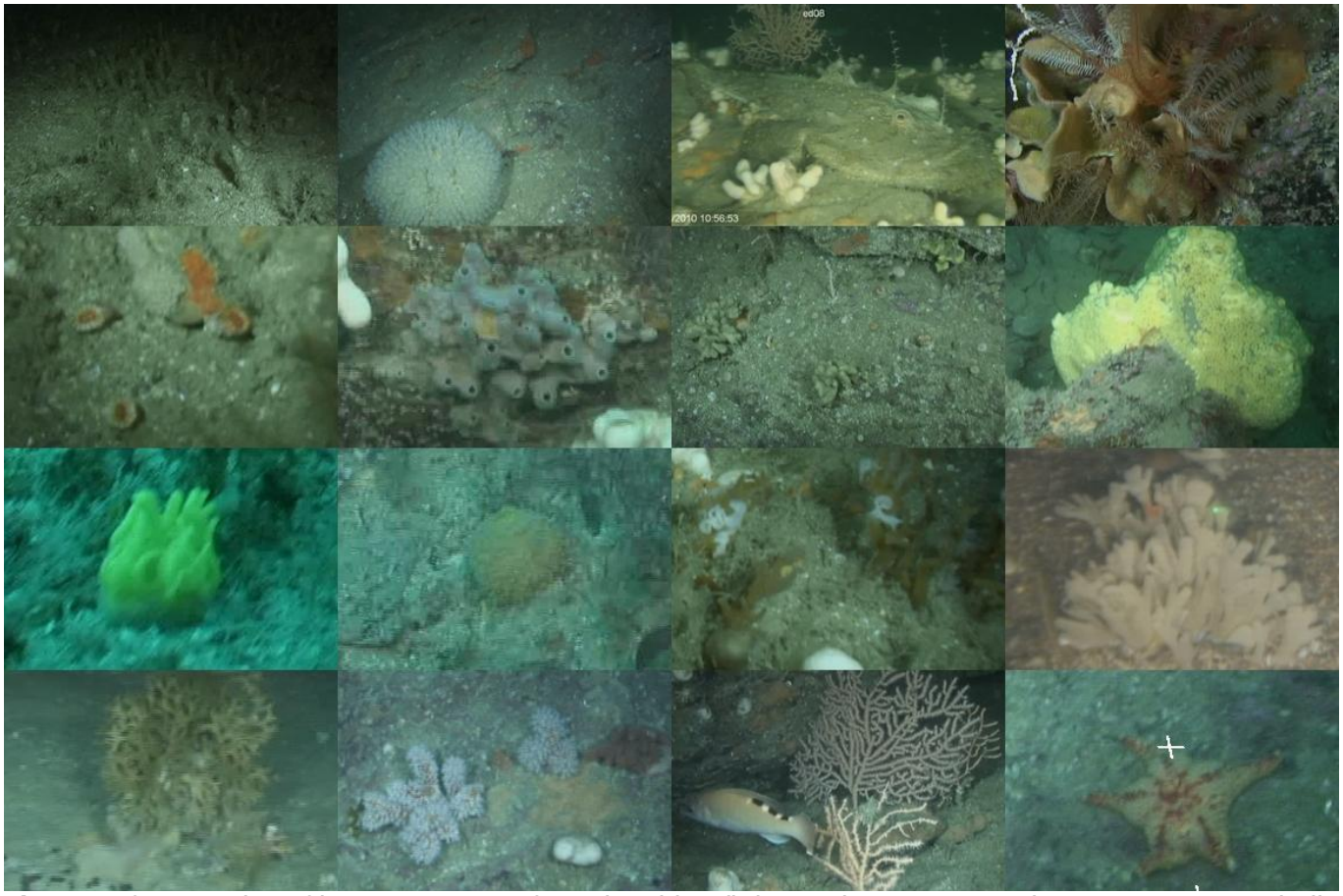


Plate 6 A few species of interest as seen from the video (l-r): Parchment worm *Chaetoptera sp*, Football Ascidian *Diazona violacea*, Angler (or Monkfish) *Lophius piscatorius*, Rosy Feather-Star *Antedon bifida*, Cup Coral *Caryophyllia sp,* Purple Volcano Sponge *Haliclona cinerea,*Webbed sponge *Axinella damicornis,*Yellow Boring Sponge *Cliona celata,*Yellow Tit Sponge *Polymastia boletiformis,* Golfball Sponge*Tethya aurantium,* Sea Chervil *Acyonidium diaphanum,* Hornwrack *Flustra foliacea,* Bryozoan *Securiflustra securifrons,* Red Fingers*Alcyonium glomeratum*, Pink Sea Fan *Eunicella verrucosa* and Red Cushion Star *Porania pulvilus*.

5.13 The most visually distinct transect was transect st01 at Start Point. This transect shows a diverse scour tolerant community with bryozoans and hydroids such as *Cellaria fistulosa*, *Flustra foliacea,* and *Tubularia indivisa,* with *Urticina felina,* erect branching sponges and *Ciocalypta penicillus* colonising the heavily gravel shrouded rock, while rock outcroppings displayed many colourful encrusting, branching and cushion sponges such as *Hemimycale columella* and *Haliclona viscosa* with the anemone *Sagartia elegans* Plate 7.Biotope designations as A4.13 and A4.213 here show a definite regional variation.

Plate 7 Illustration of the visually distinct transect st01

6 Anthropogenic Impacts

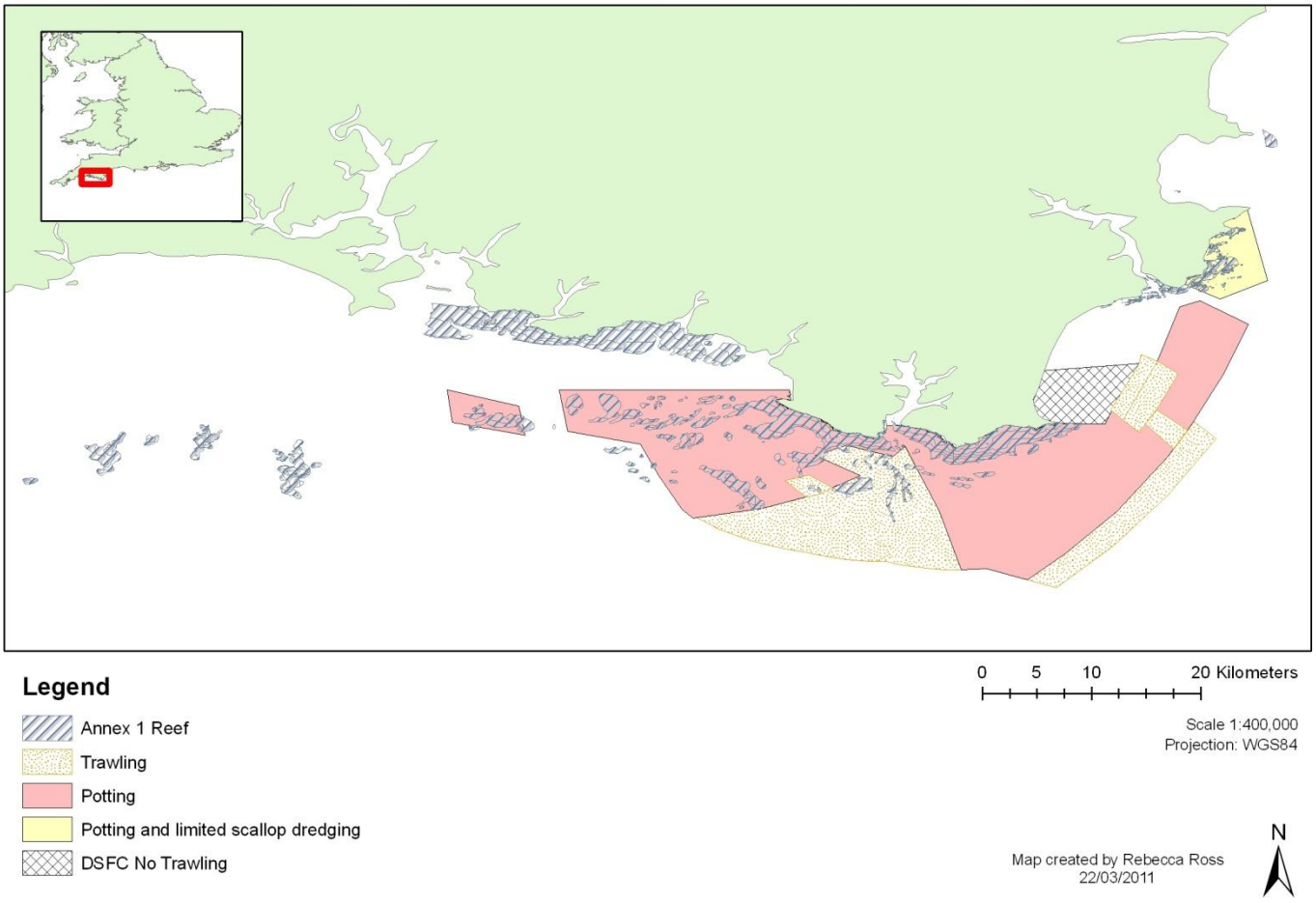


Figure 6 Map displaying the inshore potting agreement zones within the survey area. However please note that further fishing practice does take place outside of these zones.

6.1 The survey area encompasses multiple permitted fishing grounds, Figure 6, and therefore has a high potential for anthropogenic impact upon the benthic assemblages. However, due to the nature of Annex 1 bedrock reef, which made up the majority of the habitats surveyed, dredge fishing did not appear to make any impact. This is primarily due to fishers tending to avoid bedrock reefs when benthic trawling and dredging as they are more likely to damage or lose their gear. Dredges are most efficient in soft sediment habitats and as such the only dredge fishing observed during fieldwork was outside the survey area.

6.2 Potting did take place within the survey area and transect positions were often adjusted due to the presence of potters and their gear. Consequently the majority of obvious anthropogenic impact encountered was that of discarded pots and rope such as seen in Plate 8.

6.3 Of the sample images analysed 8 contained anthropogenic impact, 5 of these were rope, 1 a piece of plastic piping, 1 a lead weight, and 1, in ed11, contined damaged *Eunicella verrucosa*.

6.4 Table 4 shows all observed anthropogenic impacts as noted during survey. The most impacted transects were pp13 and ed11. Pp13 is the transect which is closest to Plymouth sound and breakwater and the signs of impact appear to come from varied sources, as might be expected due to the amount of shipping traffic that passes over this reef.

6.5 The impact observed on transect ed11 on Hatt Rock however, was entirely in the form of ropes which is indicative of the amount of potting and static net fishing that takes place in this area.

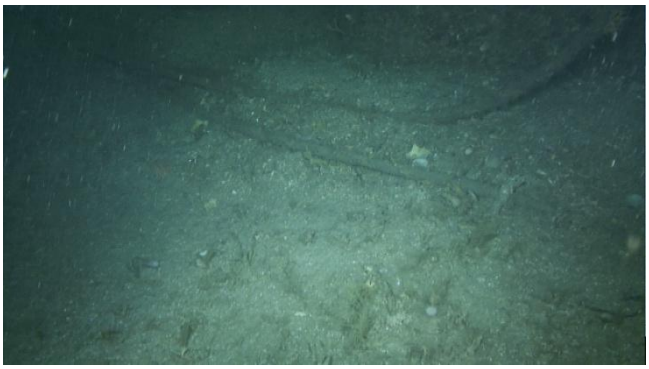


Plate 8 Anthropogenic items in eddystone. A pot in ed02 and some rope in ed11.

6.6 Torbay was the most impacted area, as encountered by these survey transects. This is in keeping with the region being the least affected by fishing restrictions. It was also the area surveyed containing the most soft substrate habitat, which accounts for the visible impact of dredge and trawl activity.

Table 4 All observed Anthropogenic Impact Indicators (A.I.I.) as noted from the video during survey.

Transect	Date	Time	Latitude	Longitude	Depth(m)	A.I.I.
3a	05/12/2010	12:24:42	50.47201000	-3.49572500	8.414	plastic bag
11a	03/12/10	14:34:05	50.40650000	-3.50976667	12.229	Net
12a	03/12/10	15:16:16	50.40300000	-3.49691667	12.004	Pot
12a	03/12/10	15:19:40	50.40306667	-3.49713333	11.409	Pipe
15a	06/12/2010	13:02:17	50.38895894	-3.48095221	38.598	Rope
15a	06/12/2010	13:02:42	50.38888168	-3.48097428	38.586	Rope
17a	06/12/2010	14:34:15	50.37572500	-3.48374167	36.428	Gear
18a	09/12/10	10:48:10	50.37208333	-3.48864722	34.867	Sand bag
21a	09/12/10	13:25:06	50.34522472	-3.49985972	33.758	Rope
24ab	10/12/2010	12:11:46	50.33878879	-3.50164650	45.235	Rope
25a	10/12/2010	12:32:06	50.33661219	-3.51502213	43.569	Rope
26a	10/12/2010	14:03:50	50.32781250	-3.51227638	49.143	Old rope
Mc01	05/12/2010	14:55:50	50.4534515	-3.4585924	38.251	Rope
Mc06	10/12/2010	13:18:18	50.33333800	-3.51657622	47.8	Old rope

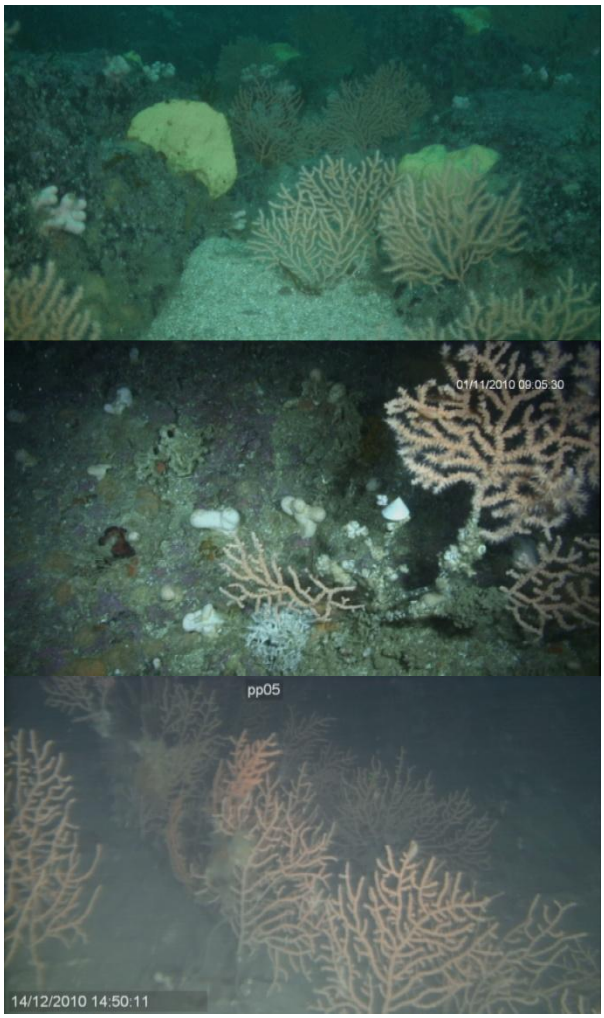
Table continued…

Transect	Date	Time	Latitude	Longitude	Depth(m)	A.I.I.
Mc08	09/12/10	12:36:00	50.34985000	-3.50390000	20.272	Net
Pp11	13/12/2010	13:22:50	50.17117778	-3.89466250	41.604	Rope
Pp13	25/10/2010	13:37:46	50.3080394	-4.1492685	20.925	Lead counter weight
Pp13	25/10/2010	13:47:05	50.30827647	-4.149556917	20.625	Old Rope
Pp13	25/10/2010	13:57:55	50.30843558	-4.149896133	20.775	Possible Military Debris
Pp13	25/10/2010	14:05:56	50.30863657	-4.15010125	22.075	liuci- 4 of 7 legs are growing back
Pp13	25/10/2010	14:23:29	50.3090518	-4.15055705	21.5	Rope or Cable, heavily fouled
Pp13	25/10/2010	14:23:55	50.30905322	-4.150595683	20.35	Rope
Pp19	13/12/2010	14:53:30	50.19551250	-3.84218750	24.055	Rope
Pp19	13/12/2010	14:58:10	50.19374305	-3.84333473	23.241	Rope
Ed02	20/09/2010	13:13:31	50.1975848	-4.263985967	32.9	Pot
Ed07	01/11/2010	09:09:24	50.19457148	-4.4212692	40.25	Liuci has only one full length leg
Ed07	01/11/2010	09:29:44	50.1940231	-4.42239515	45.45	Rope
Ed07	01/11/2010	09:33:00	50.19393398	-4.422286483	45.6	Rope
Ed11	27/09/2010	11:41:11	50.17438268	-4.483736033	48.2	Rope
Ed11	27/09/2010	11:41:32	50.17437813	-4.483731483	49.2	3 Ropes
Ed11	27/09/2010	11:42:12	50.17434833	-4.4837588	47.475	Rope
Ed11	27/09/2010	11:48:53	50.17412007	-4.484094083	43	Rope
Ed11	27/09/2010	12:06:38	50.17358245	-4.485446567	45.025	Rope
Ed11	27/09/2010	12:07:13	50.17362513	-4.484979883	43.15	Rope
Ed16	15/12/10	12:38:48	50.17362378	-4.48497898	53.073	Seafans, many broken

7 Preliminary Assessment of Feature Condition

7.1 The dataset from this survey is available to make a full assessment of feature condition according to common standards monitoring. The following are notes recommended for consideration during this process.

Eunicella verrucosa

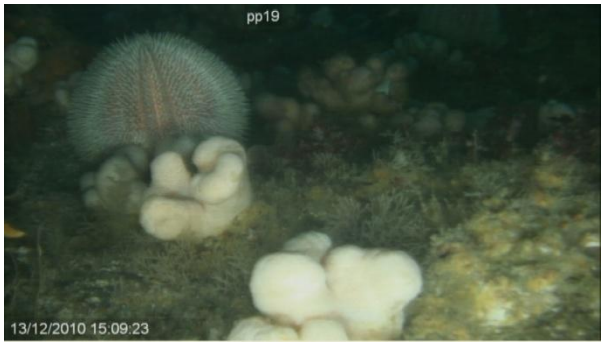


7.2 *E.verrucosa* stands in transect ed02 were considered the healthiest, with little sign of disease, fouling or anthropogenic damage.

7.3 Transect ed07 contained many fouled *E.verrucosa* some of which appear to have been smothered or diseased and have only a few living fronds left.

7.4 Transect pp05 displayed a dense stand of mature E.verrucosa, many of which were fouled.

Transitional Biotope



7.5 Cluster FCJ observed in transect pp19 represents a transitional biotope which has been affected by urchin *Echinus esculenta* abundance. A continued increase in abundance of E.esculenta would result in a full transition to the grazed **A4.215** biotope which would result in a loss of biodiversity.

8 Conclusion

8.1 This survey undertook 71 transects in the Plymouth Sound to Prawle Point & Eddystone pSAC, the Torbay portion of the Torbay & Lyme Bay pSAC, and surrounding areas.

8.2 Nominally divided into the four regions (Prawle Point to Plymouth Sound Reefs, Eddystone Reefs, Prawle Point to Start Point Reefs, and Mackerel Cove to Dartmouth Reefs) the following conclusions have been drawn:

Prawle Point to Plymouth Sound Reefs

- Infralittoral reefs were dominated by the **A3.1161** Foliose red seaweeds with dense [Dictyota dichotoma] and/or [Dictyopteris membranacea] on exposed lower infralittoral rock biotope
- Was the only region to display the **A3.1161** Foliose red seaweeds with dense [Dictyota dichotoma] and/or [Dictyopteris membranacea] on exposed lower infralittoral rock biotope
- Circalittoral reefs were predominantly of the **A4.1311** [Eunicella verrucosa] and [Pentapora foliacea] on wave-exposed circalittoral rock biotope.
- Covered the largest area but did not include more biotopes than the other regions
- Contained **Cluster FCJ A4.132/A4.215** Transition from [Corynactis viridis] and a mixed turf of crisiids, [Bugula], [Scrupocellaria], and [Cellaria] on moderately tide-swept exposed circalittoral rock to [Alcyonium digitatum] and faunal crust communities on vertical circalittoral bedrock.
- Contained the only occurance of the **A4.2122** [Caryophyllia smithii] and sponges with [Pentapora foliacea], [Porella compressa] and crustose communities on wave-exposed circalittoral rock biotope.
- Contained one of the most heavily anthropogenically impacted transects, pp13.
- Has the only occurances of the ascidian *Diazona violacea*

Eddystone Reefs

- Dominated by the **A4.1311** [Eunicella verrucosa] and [Pentapora foliacea] on wave-exposed circalittoral rock biotope.
- Had both the healthiest *Eunicella verrucosa* and the most fouled.
- Contained the largest amount of the **A4.132** [Corynactis viridis] and a mixed turf of crisiids, [Bugula], [Scrupocellaria], and [Cellaria] on moderately tide-swept exposed circalittoral rock biotope of the four regions.
- Displayed the only occurrence of **A4.12** Sponge communities on deep circalittoral rock
- Had the largest number of transect adjustments required due to potting and static net fishing gear.
- Contained one of the most heavily anthropogenically impacted transects, ed11.
- Has the most occurances of Red Fingers *Alcyonium glomeratum*.

- Was the only region in which the Pink Sea Fan Anemone *Amphianthus dohrnii* was encountered.

Prawle Point to Start Point Reefs

- Was the smallest of the four regions surveyed.
- Contained the highest number of biotopes relative to the size of the region.
- Had the most visually distinct biotope in the gravel based variation of the **A4.213** [Urticina felina] and sand-tolerant fauna on sand-scoured or covered circalittoral rock biotope in transect st01 at Start Point.
- Did not include the the **A4.1311** [Eunicella verrucosa] and [Pentapora foliacea] on wave-exposed circalittoral rock biotope.

Mackerel Cove to Dartmouth Reefs

- Contained the 29 addendum transects in speculative search of Annex1 stony reef.
- Contained the largest number of soft sediment transects surveyed.
- Did not include the the **A4.1311** [Eunicella verrucosa] and [Pentapora foliacea] on wave-exposed circalittoral rock biotope.
- Contained the only occurance of the cobble based stony reef biotope **A5.431** [Crepidula fornicata] with ascidians and anemones on infralittoral coarse mixed sediment, as seen in transect 3a.
- Was the most anthropogenically impacted region.
- Has the least fishing activity restrictions.
- Had the worst visibility of all regions.

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Appendix 1 Equipment

Video and Image Acquiring Apparatus

Remotely Operated Vehicle

Seaeye Falcon DR ROV System • TRITECH Sonar • LinkQuest USBL system • Valeport CTD sensor • altimeter • Laser Scaling • Inspector HD – ROS Compact High Definition Colour Zoom Video Camera • Kongsberg-Simrad stills camera and flash • Kongsberg HD video • 3DIVE HD-DVR - High definition recording hard drive • Qualified staff come inclusive with the ROV for its operation and maintenance.

Flying Array

Kongsberg-Simrad stills camera and flash • Bowtech HD video camera • Valeport miniCTD • Laser scaling

Vessels

"RV Falcon Spirit"

Skipper: David Uren

Alnmaritec Wave Commander Aluminium Catamaran • 13.67m day boat • 6m beam • max 12 passengers + 2 crew • twin 500hp Cummins 8.31 QSCs • 14.7 kva generator • 500kg hauler • 1tonne mounted caps in midships • 1 tonne hydraulic H frame.

"E58 Miss Pattie"

Skipper: John Walker

9.9m inshore fishing vessel • main engine power 88 kW • Fibreglass hull • 7.64 tonnes • hydraulic winch • pot hauler.

Appendix 2 Standard Operating Protocols

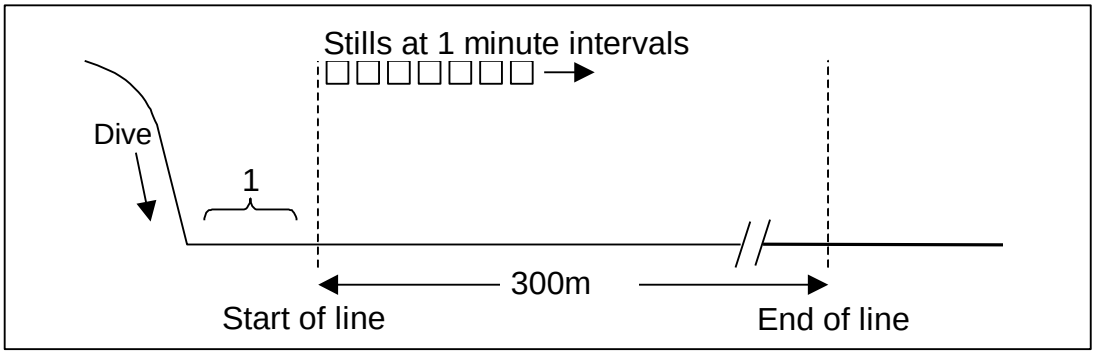
C2776: Natural England Lizard & Cape bank SAC project: Protocol for collection & analysis of video & stills images

Roger Coggan, Cefas
11/01/2008

Acquisition of images

The protocol for conducting video-transect work is explained diagrammatically in Appendix Figure A. On reaching the seabed, a short period was allowed to adjust the camera lighting before video recording started (Start of Line). Simultaneously with video recording, still images were taken at ~1 minute intervals, with a little latitude allowed (+/- a few seconds) to ensure the camera altitude was sufficient to provide a usable image of the seabed. The aim was to provide a transect of 'photo quadrats' at regular intervals along the survey line. In addition to these pre-determined stills, shots were also taken *ad-libitum* to capture specific features of interest.

Both video and stills images were taken with the same camera. A metadata overlay giving Station details, GPS time and position was recorded on the video image. This did not record on the stills images. Position of each still image could be determined by a) cross referencing the EXIF time-stamp encoded in the digital still with the navigation record or b) noting the position from the video overlay, which momentarily goes blank when a still shot is taken.



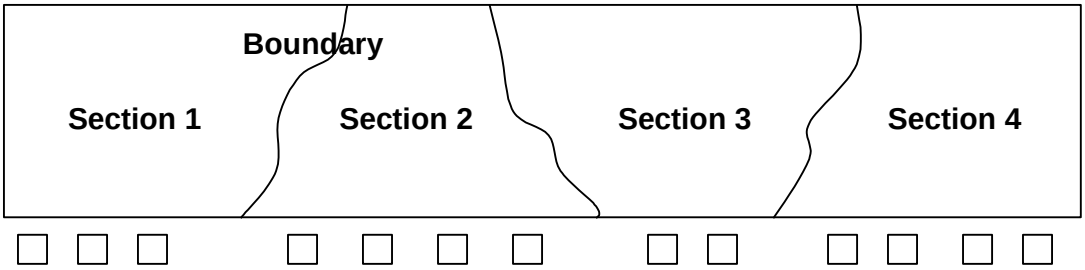
Appendix Figure A Protocol for Video & Stills acquisition

In this project, drop camera deployments were limited to a (nominal) duration of 15 minutes).

Video & Stills Analysis

The aim of the analysis was to:
1. Segment each video record into distinct sections representing different habitats.

2. Use observations from the video sections and corresponding stills images to classify the habitats according to the EUNIS scheme (and it's UK parallel: The Marine Habitat Classification for Britain and Ireland Version 04.05, JNCC)



Appendix Figure B Schematic of a video mosaic, segmented into 4 different sections, according to notable changes in the observed habitat. Also, the corresponding still images associated with each habitat or video segment.

Video Analysis protocol

The entire video record was roughly reviewed (at 4x or 8x normal speed) and the record segmented (if appropriate) to account for notable changes in the physical/biological habitat observed.

Each section (S1, S2, S3 etc) was analysed separately. Details of the substrate type, putative biotope, life-forms and faunal abundances (using the SACFOR scale) were noted on a modified MNCR Sublittoral Habitat Recording Form.

Stills analysis protocol

Recognising that many epifaunal taxa are not well imaged on video (due to their small size and the motion of the video precluding reliable identification), the stills images were used to supplement the video analysis as they provide far greater resolution, allowing smaller taxa to be seen and a greater reliability in species/taxon identification.

A 'contact sheet' was made showing all the still images from a video tow, giving both the filename and time-stamp of each image (extracted from the EXIF data embedded in the digital image) to help assign each photograph to the appropriate section of the video (if it had been segmented). For each section of video, five still images were selected as 'representative samples' for detailed analysis. For any section where fewer than five images were available, all were analysed. Wherever practical, image selection avoided images of poor quality (e.g blurred, too close or too distant from the seabed), Appendix Figure B.

Each still image was analysed separately. As for the video analysis, details of the substrate type, life-forms and faunal abundances were noted on a modified MNCR Sublittoral Habitat Recording Form. Each image was assigned the same biotope class as the 'parent' video with which it was associated (because the images were selected to be representative of that specific section of video). Faunal abundance was recorded using a % cover estimate or actual counts. These measures were also expressed in the SACFOR scale.

As drop-cameras cannot be held at a constant altitude above the seabed, the area captured in a photograph varied between images. Some images covered four or five times as much area as others. To help apply the SACFOR scale to taxa that could be counted, a slight addition was made to the published scale, as shown in the 4 right-most columns of the SACFOR table below. In practice, the differentiation between categories in the SACFOR scale reflected different orders of magnitude in actual abundance, so the scale was easy to apply. The image selection process helped to minimise variability in visible area between images.

Biotope classification using combined assessment of video & stills

The final assignment of a biotope class to a video segment was made by taking into consideration the analysis of both the video and stills images, comparing the information recorded with the biotope descriptions published on the **Marine Habitat Classification** pages if the JNCC web-site. Assignment was made on the basis of expert judgement; no statistical analyses were involved.

Electronic recording forms

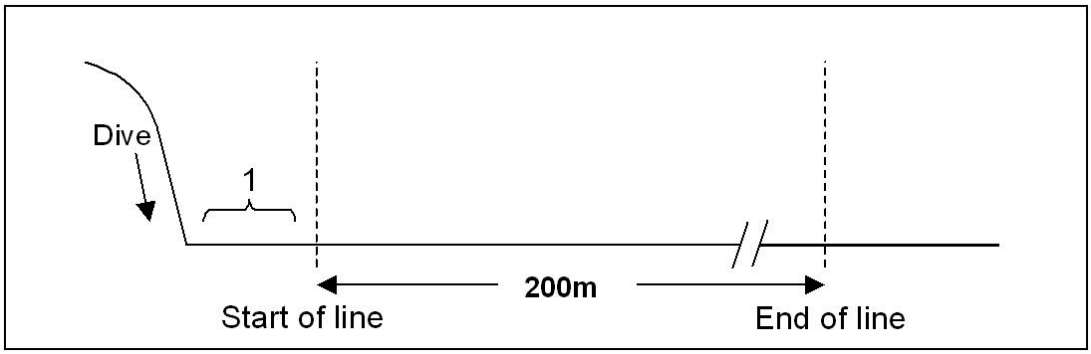
Information from the modified MNCR Sublittoral Habitat recording forms was transferred to an electronic version of the form developed by JNCC and Envision Ltd during previous similar work, the majority of fields on the form reflecting fields in the JNCC's 'Marine Recorder' database. This Excel spreadsheet allows the assessor to record some Quality Assurance information, such as the quality of the images, and the certainty of a match between the observed habitat/biotope and that described in the MNCR/EUNIS classification.

A 'Report' worksheet has been added to these electronic forms, listing the taxa identified on video and (separately) from stills) for each of the assigned biotopes. The intention here is to provide the MBA with an overview of the data to help in their assessments of sensitivity, vulnerability etc.

Adaptation of C2776 SOP: Natural England South Devon Reef SAC Survey: Protocol for the collection and analysis of video and stills images, with reference to the Lyme Bay Monitoring study methods

Acquisition of images from HD Video

The following protocol is with reference to the below diagrammatic representation of HD video acquisition. On reaching the seabed, time was given for adjustment of buoyancy and lighting. HD video was then set to record for the duration of a 200 metre, nominally 20minute, transect, Appendix Figure C. Date, time and transect ID metadata were recorded in overlay on the HD Video, while GPS location and CTD data were recorded in tandem with the video, with date and time synched for subsequent data merging. Lasers were employed for the duration of each transect to aid in the standardisation of field of view scaling.



Appendix Figure C Protocol for HD Video acquisition (after Coggan 2008)

High quality frame grabs were then taken from the HD video at intervals of 5 seconds. These were overlaid with a quadrat reference square to aid in analysis. Frame grabs were then “cleaned” retaining only images with similar fields of view and with clear enough visibility to allow for the identification of organisms >1cm in size. Retained frame grabs were then lined up as tiles to allow for random selection to form a 30 image sample set spanning the duration of the 200m transect. The resulting sample images then averaged 40seconds apart.

Video and stills analysis

The aim of the analysis was to:

1. Identify and quantify all species present in sample images
2. Identify biotopes by PRIMER cluster analysis of the quantitative image data
3. Use the video footage to ground truth and map the encountered biotopes

Stills analysis protocol

Each of the 30 still image samples from each transect was analysed separately. For each sample the metadata was recorded in an Excel spreadsheet with reference to information required by the MNCR sublittoral habitat recording form. Organisms were identified to species level where possible. Abundance

was recorded according to percentage cover or actual counts where appropriate. Details of substrate and any other notable features of interest were also recorded.

PRIMER cluster analysis

Prior to PRIMER analysis the data was adjusted for field of view and abundance and cover counts combined into a single cover based scale for simultaneous analysis.

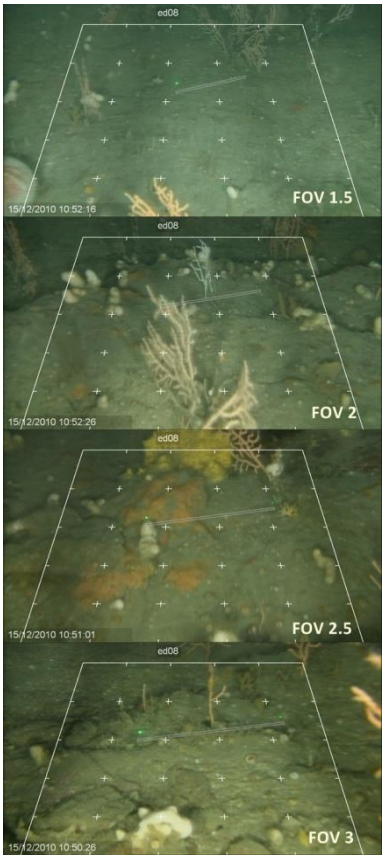
The species and abundance data for each image, where fauna was present, was then entered into PRIMER v.6. Additional metadata such as depth, temperature and salinity were also entered as factors of this data. Data was then transformed using a square root transformation, as was considered appropriate given that biotope definition requires that the dominant species maintain the greatest value, while rare species should still be allowed to make a contribution.

The transformed data was then subject to the CLUSTER routine and the biological data allowed to guide biotope definition more objectively. Clusters were then examined and confirmed by eye and compared with existing biotopes as described on the **EUNIS** and **JNCC Marine Habitat Classification** websites.

Video analysis

The video was then reviewed at x4 or x8 speed and biotopes defined by cluster analysis mapped to the transect footage. The video footage also provided the PRIMER defined biotopes with ground-truthing, confirming or altering the definitions as characterised by the image samples. Any additional biotopes encountered were then assessed by eye and mapped to each transect accordingly.

Appendix 3 Field Of View Check



Appendix Plate A The FOV Check Template

Appendix Plate Ashows a chart of images displaying sample frame grabs with visible laser points at each of the 4 accepted distances. Based on the lasers being set at 17.6 cm apart, the distance between laser points measured in overlay quadrat grid boxes corresponds with the field of view as seen in the Appendix Table A Laser distances and corresponding FOVs based on Lasers set at 17.6cm apart. below.

Appendix Table A Laser distances and corresponding FOVs based on Lasers set at 17.6cm apart.

Number of Grid Boxes	Field of View (cm^2)
1.5	58.6666
2	44
2.5	35.2
3	29.3333

This chart was used to help judge any images where one or both laser points are not visible, requiring the FOV to be matched by eye.

Appendix 4 Species Lists

Appendix Table B List of target and encountered species ordered by Phylum or Class and listed alphabetically. Those species that were targeted but not encountered during this survey are marked with a star (*).

Species	Phylum or Class	Common Name or Description	Count/Cover	Lyme Bay or SAC Target	Species of Conservation Interest
Ascidia mentula	Ascidiacea	Pink laterally attached solitary ascidian	Count		
Botryllus schlosseri	Ascidiacea	Flat encrusting colonial ascidian with starshaped colonies	Cover		
Diazona violacea	Ascidiacea	Football seasquirt	Count	SAC	
Didemnum	Ascidiacea	Forms multiple discrete white clumps attached to multiple substrata on photic reef	Count		
Diplosoma listerianum	Ascidiacea	Compound ascidian often draped over algae or Eunicella	Cover		
Lissoclinum perforatum	Ascidiacea	Lissoclinum perforatum	Cover		
*Phallusia mammillata**	Ascidiacea	A large sea squirt	Count	Lyme	Nationally Scarce
Pycnoclavella aurilucens	Ascidiacea	Colonial ascidian on Eunicella (count colonies)	Count	SAC	Nationally Scarce
Sidnyum elegans	Ascidiacea	Purple colonial ascidian	Count		
Sidnyum turbinatum	Ascidiacea	Small colonial ascidian of 6-12 zooids around central cloacal opening	Cover		

Table continued…

Species	Phylum or Class	Common Name or Description	Count/Cover	Lyme Bay or SAC Target	Species of Conservation Interest
Stolonica socialis	Ascidiacea	Orange gregarious ascidian	Count		
Aequipecten opercularis	Bivalvia	Queen Scallop	Count		
Glycymeris glycymeris	Bivalvia	Dog cockle	Count	SAC	
*Limaria hians**	Bivalvia	File shell	Count	SAC	
Lutraria lutraria	Bivalvia	Common Otter-Shell	Count		
Mytilus edulis	Bivalvia	Common/Blue mussel	Count		
Paphia rhomboides	Bivalvia	Banded carpet shell	count		
Pecten maximus	Bivalvia	Great Scallop	Count	Lyme	
Antedon bifida	Crinoidea	Crinoid/ Feather star	Count		
Echinus esculentus	Echinoidea	Common sea urchin	Count		
Spatangus purpureus	Echinoidea	Purple heart urchin	Count		
Nudibranch Sp. Eggs	Egg cluster	String of nudibranch eggs	Count		
Tritonia nilsodhneri Eggs	Egg cluster	Tritonia nilsodheri Eggs	Count		
Buccinum undatum	Gastropoda	Common Whelk	Count		
Calliostoma zizyphinum	Gastropoda	Painted Topshell	Count		
Crepidula fornicata	Gastropoda	Slipper Limpit	Count		
Gibbula cineraria	Gastropoda	Grey Topshell	Count		
Tritonia nilsodhneri	Gastropoda	Whip fan nudibranch	Count	SAC	Nationally Scarce

Table continued…

Species	Phylum or Class	Common Name or Description	Count/Cover	Lyme Bay or SAC Target	Species of Conservation Interest
Trivia monacha	Gastropoda	Spotted Cowrie	Count		
Turritella communis	Gastropoda	Tower shell	Count		
Alcyonidium diaphanum	Gymnolaemata	Sea chervil	Count	SAC	
Caberea ellisii	Gymnolaemata	Forms brown/greyish brown fan shaped colonies	Count		
Cellaria fistulosa	Gymnolaemata	Fine branching bryozoan	Count		
Cellepora pumicosa	Gymnolaemata	A orange/brown circular sea mat	Count	Lyme	
Electra pilosa	Gymnolaemata	Star shaped "hairy sea mat"	Count		
Flustra foliacea	Gymnolaemata	Hornwrack	Count	SAC	
Parasmittina trispinosa	Gymnolaemata	Pale orange small patches encrusting	Cover		
Pentapora foliacea	Gymnolaemata	Ross coral	Count	Lyme & SAC	
Securiflustra securifrons	Gymnolaemata	Flat erect bryo cf Flufol but smaller and less rounded	Count	SAC	
Actinothoe sphyrodeta	Hexacorallia	Sandalled anemone	Count	Lyme	
Adamsia carciniopados	Hexacorallia	Cloak Anemone	Count		
Aiptasia mutabilis	Hexacorallia	Trumpet anemone	Count	Lyme	Nationally Scarce
Amphianthus dohrnii	Hexacorallia	Sea fan anemone	Count	SAC	UK BAP Species; Nationally Rare
Anemonia viridis	Hexacorallia	Snakelocks anemone	count		

Table continued…

Species	Phylum or Class	Common Name or Description	Count/Cover	Lyme Bay or SAC Target	Species of Conservation Interest
Caryophyllia	Hexacorallia	Devonshire/Southern cup coral (C. smithii/ C. inornata) May also be Hoplangia durotrix	Count	SAC	*C. inornata* is Nationally Rare
Cereus pedunculatus	Hexacorallia	Daisy Anemone	Count		
Cerianthus lloydii	Hexacorallia	Burrowing Anemones	Count		
Corynactis viridis	Hexacorallia	Jewel anemone	Count		
*Hoplangia durotrix**	Hexacorallia	Weymouth carpet coral	Count	SAC	Nationally Rare
*Isozoanthus sulcatus**	Hexacorallia	Peppercorn Anemone	Count	SAC	
Leptopsammia pruvoti	Hexacorallia	Sunset coral	Count	Lyme & SAC	UK BAP Species; Nationally Rare
Mesacmaea mitchellii	Hexacorallia	Burrowing anemone, max 36 grey/brown, cheveroned tentacles	Count		
Metridium senile	Hexacorallia	Plumose anemone	Count		
*Parazoanthus anguicomus**	Hexacorallia	White trumpet anemone	Count	SAC	Nationally Scarce
*Parazoanthus axinellae**	Hexacorallia	Orange trumpet anemone	Count	SAC	
Sagartia elegans	Hexacorallia	sagartiid anemone	Count		
Sagartiogeton undatus	Hexacorallia	Rock attached but burried anemone with longitudinal stripes on tentacles	Count		
Urticina felina	Hexacorallia	Dhalia anemone	Count		

Table continued…

Species	Phylum or Class	Common Name or Description	Count/Cover	Lyme Bay or SAC Target	Species of Conservation Interest
Aslia lefevrei	Holothuroidea	Cucumarid holothuroidean with brown/grey/black tentacles in crevices <30m	Count		
Holothuria forskali	Holothuroidea	Black sea cucumber	Count	SAC	
Aglaophenia	Hydrozoa	Green hydroid w/ yellow corbulae	Count		*A.kirchenpaueri* is Nationally Scarce
Gymnangium montagui	Hydrozoa	indian green feathers hydroid	Count		
Halecium halecium	Hydrozoa	Herringbone Hydroid	Count	Lyme & SAC	
Hydrallmania falcata	Hydrozoa	Spiralling feathered hydroid	Count	Lyme	
Hydroides	Hydrozoa	Unid Hydroid Species	Count		
Nemertesia antennina	Hydrozoa	Antenna hydroid	Count	SAC	
Nemertesia ramosa	Hydrozoa	Branching antenna hydroid	Count		
Obelia	Hydrozoa	Fouling hydroid fir	Cover		
Tubularia indivisa	Hydrozoa	Pink mouthed hydroid	Count	SAC	
Cancer pagurus	Malacostraca	Edible crab	Count	Lyme	
*Homarus gammarus**	Malacostraca	Common lobster	Count	Lyme	
Liocarcinus depurator	Malacostraca	Harbour crab	Count		
Macropodia tenuirostris	Malacostraca	Slender spider crab	Count		
Maja	Malacostraca	Common Spider Crab	Count		

Table continued…

Species	Phylum or Class	Common Name or Description	Count/Cover	Lyme Bay or SAC Target	Species of Conservation Interest
Necora puber	Malacostraca	Velvet swimming crab	Count	Lyme	
Pagurus	Malacostraca	Hermit crab	Count		
*Scyllarus arctus**	Malacostraca	Slipper lobster	Count	SAC	
Alcyonium digitatum	Octocorallia	Dead mans fingers	Count	Lyme & SAC	
Alcyonium glomeratum	Octocorallia	Red fingers	Count	SAC	
Eunicella verrucosa	Octocorallia	Pink Sea Fan	Count	Lyme & SAC	UK BAP Species; Nationally Scarce
*Parerythropodium hibernicum**	Octocorallia	Pink fingers	Count	SAC	
*Alaria esculenta**	Phaeophyceae	Dabberlocks	Count	SAC	
*Carpomitra costata**	Phaeophyceae	Many branched dorso-ventrally flattened thalli	Count	SAC	
Desmarestia aculeata	Phaeophyceae	Witches Hair	Count		
Dictyopteris membranacea	Phaeophyceae	Midribbed wrack-like brown algae	Count		
Dictyota dichotoma	Phaeophyceae	Flat thullus no midrib	Count	SAC	
Laminaria	Phaeophyceae	Laminaria species, ID restriced by image or speicmen quality	Count		
Laminaria hyperborea	Phaeophyceae	Cuvie	Count		
Ochrophyte Species	Phaeophyceae	Ochrophyte species, ID restrcted by clarity of image	Count		
*Sphacelaria mirabilis**	Phaeophyceae	A brown algea	Count	SAC	

Table continued…

Species	Phylum or Class	Common Name or Description	Count/Cover	Lyme Bay or SAC Target	Species of Conservation Interest
UnID Ochrophyte Species 1	Phaeophyceae	Dichotymous leafy type, ID restricted by clarity of image	Count		
UnID Ochrophyte Species 2	Phaeophyceae	Filimentus type, ID restricted by clarity of image	Count		
UnID Ochrophyte Species 3	Phaeophyceae	Broad leaf type, ID restricted by clarity of image	Count		
Phoronis	Phoronida	Horseshoe Worms	Count		
Bispira volutacornis	Polychaeta	Twin spiral feather duster worm	Count		
Chaetopteridae	Polychaeta	Parchment worm species	Count		
Lanice conchilega	Polychaeta	Sand Mason Worm	Count		
Pomatoceros triqueter	Polychaeta	Keel worm	Count		
Sabella pavonina	Polychaeta	Peacock worm	Count		
Serpula vermicularis	Polychaeta	Organ pipe worm	Count		
Spirorbis spirorbis	Polychaeta	Calcareous worm tubes	Count		
Axinella damicornis	Porifera	Stubby webbed erect sponge	Count	SAC	Nationally Scarce
Axinella infundibuliformis	Porifera	Cup/lamellate sponge	Count	SAC	
Ciocalypta penicillus	Porifera	Pencil Sponge	Count		
Cliona celata	Porifera	Boring sponge	Cover	Lyme & SAC	
Dercitus bucklandi	Porifera	Black sponge	Cover		

Table continued…

Species	Phylum or Class	Common Name or Description	Count/Cover	Lyme Bay or SAC Target	Species of Conservation Interest
Dysidea fragilis	Porifera	encr/massive with tiny pyramidal projections and scattered 5mm oscula	Cover		
Erect branching sponges	Porifera	Erect branching sponges	Count	Lyme	*Adreus fascicularis* is Nationally Scarce and was seen near Hilsea Point.
Esperiopsis fucorum	Porifera	The shredded carrot sponge	Cover	SAC	
Halichondria panicea	Porifera	Massive form of breadcrumb sponge	Count		
Haliclona cinerea	Porifera	Small purple volcano sponge	Count		
Haliclona viscosa	Porifera	Massive textured sponge with large oscules	Cover		
Hemimycale columella	Porifera	Crater Sponge	Cover		
Parasmittina trispinosa	Porifera	*Parasmittina trispinosa*	Cover		
Pachymatisma johnstonia	Porifera	Elephants ear sponge	Cover		
Polymastia boletiformis	Porifera	Yellow hedgehog sponge	Count		
Polymastia mammillaris	Porifera	Yellow translucent papillae, less distinct than P. boletiformis	Count		
Pseudosuberites sulphureus	Porifera	Yellow encr porifera	Cover		
Red Encrusting Porifera	Porifera	Red Encrusting Porifera	Cover		

Table continued…

Species	Phylum or Class	Common Name or Description	Count/Cover	Lyme Bay or SAC Target	Species of Conservation Interest
Scypha compressa	Porifera	Purse Sponge	Count		
Suberites	Porifera	Sulphur sponge	Count		
Suberites carnosus	Porifera	Orange spherical sponge	Count		
Tethya aurantium	Porifera	Golfball sponge	Count	Lyme	
White Encrusting Porifera	Porifera	White Encrusting Porifera	Cover		
Yellow Encrusting Porifera	Porifera	Yellow Encrusting Porifera	Cover		
*Cryptopleura ramosa**	Rhodophyta	Flat thallus low lying	Count	SAC	
Heterosiphonia plumosa	Rhodophyta	Fluffy/plume-like rhodophyte	Count		
Lithophyllum	Rhodophyta	Red Coralline Algae	Cover	SAC	
Meredithia microphylla	Rhodophyta	Flat thalli rhodophyte	Count		
*Phycodrys rubens**	Rhodophyta	Sea Oak	Count	SAC	
Phyllophora crispa	Rhodophyta	Cartillaginous, rounded tips, dichot, successive regrowth	Count		
*Phyllophora crispa**	Rhodophyta	Flat thalli dichotomously branched, pink or red, rounded tips	Count	SAC	
Rhodophyte species	Rhodophyta	Rhodophyte species	Count		
UnID Rhodophyte species 1	Rhodophyta	Flat thallus morphotype, ID restricted by clarity of image	Count		

Table continued…

Species	Phylum or Class	Common Name or Description	Count/Cover	Lyme Bay or SAC Target	Species of Conservation Interest
UnID Rhodophyte species 2	Rhodophyta	Finely branching "fluffy" morphotype, ID restricted by clarity of image	Count		
UnID Rhodophyte species 3	Rhodophyta	Narrow flat branching thallus morphotype, ID restricted by clarity of image	Count		
Anseropoda placenta	Stelleroidea	Goose foot starfish	Count		
Asterias rubens	Stelleroidea	Common starfish	Count		
Asterina gibbosa	Stelleroidea	Cushion star	Count	Lyme	
Henricia sanguinolenta	Stelleroidea	Bloody Henry	Count		
Luidia ciliaris	Stelleroidea	7 arm starfish	Count		
Marthasterias glacialis	Stelleroidea	Spiny starfish	Count		
Ophiocomina nigra	Stelleroidea	Black brittlestar	Count		
Ophiothrix fragilis	Stelleroidea	Common brittlestar	Count		
Ophiura ophiura	Stelleroidea	Large Brittlestar	count		
Porania pulvillus	Stelleroidea	Cushion star	Count		
Algal turf	Turf	Juvenile and low growing algae appearing as a turf	Cover	SAC	
Hydroid and Bryozoan Turf	Turf	Hydroid and Bryozoan Turf	Cover		
Hydroid turf	Turf	Hydroid turf	Cover		

Species list by region

Eddystone

Aequipecten opercularis
Aglaophenia sp
Alcyonidium diaphanum
Alcyonium digitatum
Alcyonium glomeratum
Amphianthus dohrnii
Antedon bifida
Aslia lefevrei
Asterias rubens
Asterina gibbosa
Axinella damicornis
Axinella infundibuliformis
Calliostoma zizyphinum
Caryophyllia
Cellapora pumicosa
Cellaria fistulosa
Cellepora pumicosa
Chaetopteridae
Ciocalypta penicillus
Cliona celata
Corynactis viridis
Dichotymous Rhodophyte sp
Dictyopteris membranacea
Dictyota dichotoma
Diplosoma listerianum
Echinus esculentus
Erect branching sponges
Esperiopsis fucorum
Eunicella verrucosa
Filimentous Rhodophyte sp
Flustra foliacea
Gibbula cineraria
Gymnangium montagui
Halecium halecium
Haliclona cinerea
Henricia sanguinolenta
Holothuria forskali
Hydroid and byrozoan turf
Hydroid sp
Hydroid turf
Laminaria hyperborea
Lanice conchilega
Leafy Rhodophyte sp
Lithophyllum
Luidia ciliaris
Marthasterias glacialis
Metridium senile
Nemertesia antennina
Nemertesia ramosa
Obelia
Ochrophyte sp
Parasmittina trispinosa
Pentapora foliacea
Polymastia boletiformis
Polymastia mammillaris
Pomatoceros triqueter
Porania pulvillus
Pycnoclavella aurilucens
Red encrusting porifera
Sabella pavonina
Securiflustra securifrons
Tethya aurantium
Tubularia indivisa
White encrusting porifera
Yellow encrusting porifera

Start Point

Actinothoe sphyrodeta
Aequipecten opercularis
Aglaophenia sp
Alcyonidium diaphanum
Alcyonium digitatum
Antedon bifida
Asterias rubens
Caberea ellisii
Calliostoma zizyphinum
Caryophyllia
Cellaria fistulosa
Cellepora pumicosa
Chaetopteridae
Ciocalypta penicillus
Cliona celata
Corynactis viridis
Desmarestia aculeata
Dichotymous Rhodophyte sp
Dictyopteris membranacea
Didemnum sp.
Diplosoma listerianum
Echinus esculentus
Erect branching sponges
Filimentous Ochrophyte sp
Filimentous Rhodophyte sp
Flustra foliacea
Glycymeris glycymeris
Halecium halecium
Haliclona viscosa
Hydrallmania falcata
Hydroid and byrozoan turf
Hydroid turf
Laminaria sp
Lanice conchilega
Leafy Ochrophyte sp
Leafy Rhodophyte sp
Lissoclinum perforatum
Lithophyllum
Luidia ciliaris
Lutraria lutraria
Macropodia tenuirostris
Marthasterias glacialis
Metridium senile
Necora puber
Nemertesia antennina
Nemertesia ramosa
Ophiocomina nigra
Ophiothrix fragilis
Pagurus
Parasmittina trispinosa
Pentapora foliacea
Phoronis
Phycodrys rubens
Pomatoceros triqueter
Red encrusting porifera
Sidnyum elegans
Tethya aurantium
Tubularia indivisa
Urticina felina
White encrusting porifera
Yellow encrusting porifera

Plymouth Sound to Prawle Point

Adamsia carciniopados
Aequipecten opercularis
Aglaophenia sp
Aiptasia mutabilis
Alcyonidium diaphanum
Alcyonium digitatum
Alcyonium glomeratum
Algal turf
Antedon bifida
Aslia lefevrei
Asterias rubens
Axinella damicornis
Bispira volutacornis
Caberea ellisii
Calliostoma zizyphinum
Cancer pagurus
Caryophyllia
Cellapora pumicosa
Cellaria fistulosa
Cellepora pumicosa
Cereus pedunculatus
Chaetopteridae
Ciocalypta penicillus
Cliona celata
Corynactis viridis
Cryptopleura ramosa
Dercitus bucklandi
Diazona violacea
Dichotymous Ochrophyte sp
Dichotymous Rhodophyte sp
Dictyopteris membranacea
Dictyota dichotoma
Didemnum sp.
Diplosoma listerianum
Dysidea fragilis
Echinus esculentus
Electra pilosa
Erect branching sponges (including Adreus fascicularis)
Esperiopsis fucorum
Eunicella verrucosa
Filimentous Ochrophyte sp
Filimentous Rhodophyte sp
Flustra foliacea
Gymnangium montagui
Halecium halecium
Halichondria panicea
Haliclona cinerea
Hemimycale columella
Henricia sanguinolenta
Heterosiphonia plumosa
Holothuria forskali
Hydrallmania falcata
Hydroid and byrozoan turf
Hydroid sp
Hydroid turf
Laminaria sp
Lanice conchilega
Leafy Rhodophyte sp
Lissoclinum perforatum
Lithophyllum
Luidia ciliaris
Macropodia tenuirostris
Marthasterias glacialis
Mesacmaea mitchellii
Metridium senile
Microciona atrasanguinea
Necora puber
Nemertesia antennina
Nemertesia ramosa
Nudibranch Sp. Eggs
Obelia
Ochrophyte sp
Ophiocomina nigra
Ophiothrix fragilis
Ophiura ophiura
Pachymatisma johnstonia
Pagurus
Paphia rhomboides
Parasmittina trispinosa
Pecten maximus
Pentapora foliacea
Phyllophora crispa
Polymastia boletiformis
Polymastia mammillaris
Pomatoceros triqueter
Pseudosuberites sulphureus
Pycnoclavella aurilucens
Red encrusting porifera
Rhodophyte sp
Sabella pavonina
Sagartia elegans
Scypha compressa
Serpula vermicularis
Spirorbis spirorbis
Stolonica socialis
Suberites
Suberites carnosus
Tethya aurantium
Tubularia indivisa
Turritella communis
Urticina felina
White encrusting porifera
Yellow encrusting porifera

Torbay

Actinothoe sphyrodeta
Aequipecten opercularis
Alcyonium digitatum
Anemonia viridis
Antedon bifida
Asterias rubens
Buccinum undatum
Caberea ellisii
Caryophyllia
Cellaria fistulosa
Cereus pedunculatus
Cerianthus lloydii
Chaetopteridae
Cliona celata
Corynactis viridis
Crepidula fornicata
Dichotymous Rhodophyte sp
Didemnum sp.
Electra pilosa
Erect branching sponges
Eunicella verrucosa
Glycymeris glycymeris
Halecium halecium
Haliclona cinerea
Hydrallmania falcata
Hydroid and byrozoan turf
Hydroid sp
Hydroid turf
Laminaria sp
Lanice conchilega
Leafy Rhodophyte sp
Liocarcinus depurator
Lutraria lutraria
Macropodia tenuirostris
Maja brachydactyla
Mesacmaea mitchellii
Metridium senile
Mytilus edulis
Necora puber

Coninued overleaf…

Nemertesia antennina
Nemertesia ramosa
Obelia
Ophiothrix fragilis
Ophiura ophiura
Pachymatisma johnstonia
Pagurus
Parasmittina trispinosa
Pecten maximus
Phycodrys rubens
Pomatoceros triqueter
Red encrusting porifera
Rhodophyte sp
Sagartia elegans
Sagartiogeton undatus
Spatangus purpureus
Spirorbis spirorbis
Tubularia indivisa
Turritella communis
Urticina felina
White encrusting porifera
Yellow encrusting porifera

Appendix 5 Biotope List

PRIMER Defined EUNIS Biotopes

A3.116
IR.HIR.KFaR.FoR
Foliose red seaweeds on exposed lower infralittoral rock
Website: **http://eunis.eea.europa.eu/habitats/2002** (March 2011)

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. Most of the red seaweeds are common to the kelp zone above, while the faunal component of the biotope is made up of species that are found either in the kelp zone or the animal-dominated upper circalittoral below. Foliose species commonly present include [Dilsea carnosa], [Hypoglossum hypoglossoides, Schottera nicaeensis], [Cryptopleura ramosa] and [Delesseria sanguinea]. The red seaweed species composition varies considerably; at some sites a single species may dominate (particularly [Plocamium cartilagineum]). Small filamentous red seaweeds can be found here as well. These include species such as [Heterosiphonia plumosa, Brongniartella byssoides]. As well as a varied red seaweed component, this biotope may also contain occasional kelp plants and patches of the brown foliose seaweed [Dictyota dichotoma]. Coralline crusts covers the bedrock beneath the seaweeds. The fauna generally comprises low-encrusting forms such as the tubeworms [Pomatoceros] spp., anthozoans including [Alcyonium digitatum], [Urticina felina] and [Caryophyllia smithii]) and occasional sponge crusts such as [Cliona celata, Esperiopsis fucorum], [Scypha ciliata] and [Dysidea fragilis]. More mobile fauna include the gastropod [Calliostoma zizyphinum], the echinoderms [Echinus esculentus] as well as the starfish [Asterias rubens] and [Marthasterias glacialis] and lastly, the crab [Cancer pagurus]. Bryozoan crusts such as [Electra pilosa] can be found fronds on the foliose red seaweeds while scattered hydroids such as [Nemertesia antennina] form colonies on shells, cobbles and available rock. At some sites erect bryozoans [Crisia] spp. and [Bugula] spp. are present. Ascidians such as [Clavelina lepadiformis] and [Clavelina lepadiformis] may also be common. In the north the foliose red seaweed [Callophyllis laciniata] may occur.

Situation: This biotope is generally found at or below the lower limit of the kelp, below either kelp forest or park (LhypR.Ft and LhypR.Pk).

Temporal variation: Many of the red seaweeds, which occur in this biotope, have annual fronds, which tend to die back in the autumn and regenerate again in the spring. This produces a seasonal change in the density of the seaweed cover, which is substantially reduced over winter months and reaches its most dense between April to September.

A3.1161
IR.HIR.KFaR.FoR.Dic
Foliose red seaweeds with dense [Dictyota dichotoma] and/or [Dictyopteris membranacea] on exposed lower infralittoral rock
Website: **http://eunis.eea.europa.eu/habitats/2003** (March 2011)

A dense turf of foliose red seaweeds mixed with a dense turf of the foliose brown seaweeds [Dictyota dichotoma] and/or [Dictyopteris membranacea] on exposed and moderately exposed lower infralittoral rock, generally at or below the lower limit of the kelp zone. In some areas the lower infralittoral is subject to a moderate amount of scour from nearby sand. [D. dichotoma] is relatively tolerant of such scour and in such areas a zone forms with other sand-tolerant seaweeds. [D. membranacea] is confined to south-western coasts. Typically brown seaweeds dominate the seabed or are at least in equal abundance to the red seaweeds, some of which may also form dense stands such as [Plocamium cartilagineum],

[Calliblepharis ciliata, Cryptopleura ramosa, Bonnemaisonia asparagoides], [Heterosiphonia plumosa, Delesseria sanguinea] and [Brongniartella byssoides]. The urchin [Echinus esculentus] can be found grazing the rock surface which can be covered in coralline algae. The anthozoans [Caryophyllia smithii] and [Alcyonium digitatum] are usually present in this biotope along with the tube-building worm [Pomatoceros] sp. which is more common in sand-scoured areas. The starfish [Asterias rubens] and [Henricia] sp. and sponge crusts including [Cliona celata] can also be found here. [D. dichotoma] also occurs in the kelp park, and records should only be assigned to this biotope where kelp such as [Laminaria hyperborea] is sparse or absent and a relatively high density of [D. dichotoma] and/or [D. membranacea] is present.

Situation: This biotope usually occurs at or below the lower limit of kelp [L. hyperborea] (LhypR.Pk or Lhyp). In south-west England a zone of mixed kelp forest [L. hyperborea] and [Laminaria ochroleuca] may occur above the dense foliose algae (LhypR.Loch). FoR.Dic marks the lower limit of the lower infralittoral zone.

Temporal variation: Like many of the red seaweeds found in this biotope the dominant brown seaweeds [D. membranacea] and [D. dichotoma] have annual fronds which tend to die back in the autumn and regenerate again in the spring. This produces a seasonal change in the density of the seaweed cover, which is substantially reduced over winter months and reaches its most dense between April and September.

A3.12
IR.HIR.KSed
Sediment-affected or disturbed kelp and seaweed communities
Website: **http://eunis.eea.europa.eu/habitats/570** (March 2011)

Infralittoral rock habitats, subject to disturbance through mobility of the substratum (boulders or cobbles) or abrasion/covering by nearby coarse sediments or suspended particulate matter (sand). The associated communities can be quite variable in character, depending on the particular conditions, which prevail. The typical [Laminaria hyperborea] and red seaweed communities of stable open coast rocky habitats (A3.21) are replaced by those, which include more ephemeral species or those tolerant of sand and gravel abrasion. As such [Laminaria saccharina], [Saccorhiza polyschides] or [Halidrys siliquosa] may be prominant components of the community.

A4.13
CR.HCR.XFa
Mixed faunal turf communities on circalittoral rock
Website: **http://eunis.eea.europa.eu/habitats/5418** (March 2011)

This habitat type occurs on wave-exposed circalittoral bedrock and boulders, subject to tidal streams ranging from strong to moderately strong. This complex is characterised by its diverse range of hydroids ([Halecium halecinum], [Nemertesia antennina] and [Nemertesia ramosa]), bryozoans ([Alcyonidium diaphanum], [Flustra foliacea], [Bugula flabellata] and [Bugula plumosa]) and sponges ([Scypha ciliata], [Pachymatisma johnstonia], [Cliona celeta], [Raspailia ramosa], [Esperiopsis fucorum], [Hemimycale columella] and [Dysidea fragilis]) forming an often dense, mixed faunal turf. Other species found within this complex are [Alcyonium digitatum], [Urticina felina], [Sagartia elegans], [Actinothoe sphyrodeta], [Caryophyllia smithii], [Pomatoceros triqueter], [Balanus crenatus], [Cancer pagurus], [Necora puber], [Asterias rubens], [Echinus esculentus] and [Clavelina lepadiformis].

A4.132
CR.HCR.XFa.CvirCri
[Corynactis viridis] and a mixed turf of crisiids, [Bugula], [Scrupocellaria], and [Cellaria] on moderately tide-swept exposed circalittoral rock
Website: **http://eunis.eea.europa.eu/habitats/2096** (March 2011)

This biotope typically occurs on wave-exposed, vertical or steep, circalittoral bedrock or large boulders, usually subject to moderate or strong tidal streams. It is characterised by dense aggregations of the

anemone [Corynactis viridis] and the cup coral [Caryophyllia smithii] intermixed with a short bryozoan turf of one or more [Crisia] spp., [Scrupocellaria] spp., [Bugula] spp. and [Cellaria] spp. Occasionally, this turf obscures the underlying [C. virdis] and [C. smithii]. Cushion and encrusting sponges, particularly [Pachymatisma johnstonia], [Cliona celata], [Esperiopsis fucorum] and [Dysidea fragilis], are present in moderate amounts at many sites. The axinellid sponges [Stelligera] spp. and [Raspailia] spp. are less frequently recorded. Clumps of large hydroids such as [Nemertesia antennina] and [Nemertesia ramosa] as well as the soft coral [Alcyonium digitatum] and the bryozoan [Alcyonidium diaphanum] may be found covering the hard substratum. The anemones [Actinothoe sphyrodeta] and [Sagartia elegans] are typically present in low numbers, while the hard `coral' [Pentapora foliacea] is also occasionally observed. The most frequently recorded echinoderms are [Marthasterias glacialis] and [Asterias rubens], although other species such as [Echinus esculentus] may also be seen. The rocky substratum may have a patchy covering of encrusting red seaweeds/algae. The crabs [Necora puber] and [Cancer pagurus] may be seen in crevices or under overhangs. This biotope is regularly recorded around south west England and Wales, often on vertical rock faces.

Situation: Due to its wave-exposed nature, kelp park and forest biotopes (LhypR and Ala) are commonly found in the infralittoral zone shallower than this biotope, and feature species such as [Laminaria hyperborea], [Sacchoriza polyschides] and [Alaria esculenta].

A4.1311
CR.HCR.XFa.ByErSp.Eun
[Eunicella verrucosa] and [Pentapora foliacea] on wave-exposed circalittoral rock
Website: **http://eunis.eea.europa.eu/habitats/2108** (March 2011)

This variant typically occurs on wave-exposed, steep, circalittoral bedrock, boulder slopes and outcrops, subject to varying tidal streams. This silty variant contains a diverse faunal community, dominated by the seafan [Eunicella verrucosa], the bryozoan [Pentapora foliacea] and the cup coral [Caryophyllia smithii]. There are frequently numerous [Alcyonium digitatum], and these may become locally abundant under more tide-swept conditions. [Alcyonium glomeratum] may also be present. A diverse sponge community is usually present, including numerous erect sponges; species present include [Cliona celata], [Raspailia ramosa], [Raspailia hispida], [Axinella dissimilis], [Stelligera stuposa], [Dysidea fragilis] and [Polymastia boletiformis]. [Homaxinella subdola] may be present in the south west. A hydroid/bryozoan turf may develop in the understorey of this rich sponge assemblage, with species such as [Nemertesia antennina], [Nemertesia ramosa], crisiids, [Alcyonidium diaphanum] and [Bugula plumosa]. The sea cucumber [Holothuria forskali] may be locally abundant, feeding on the silty deposits on the rock surface. Other echinoderms encountered include the starfish [Marthasterias glacialis] and the urchin [Echinus esculentus]. Other fauna includes aggregations of colonial ascidians [Clavelina lepadiformis] and [Stolonica socialis]. Anemones such as [Actinothoe sphyrodeta] and [Parazoanthus axinellae] may be seen dotted across the rock surface. This biotope is present in south west England and Wales. Situation: This biotope is commonly found on rocky outcrops, surrounded by coarse sediment. This may be in the form of shelly gravel or muddy gravel, supporting [Urticina felina], [Cerianthus lloydi] and [Neopentadactyla mixta]. Above ByErSp.Eun, dense kelp forest containing [Saccorhiza polyschides] is usually found.

A4.2122
CR.MCR.EcCr.CarSp.PenPcom
[Caryophyllia smithii] and sponges with [Pentapora foliacea], [Porella compressa] and crustose communities on wave-exposed circalittoral rock
Website: **http://eunis.eea.europa.eu/habitats/5593** (March 2011)

This variant is typically found on the upper faces and vertical sides of wave-exposed bedrock or boulders subject to moderately strong to weak tidal streams. The fauna is often sparse with the frequently observed [Echinus esculentus] giving it a grazed appearance, but the community may also be affected by violent storm action working into deep water during winter storms. Despite this spartan appearance, the community is relatively diverse and contains a wide range of sponges, hydroids, bryozoans and

echinoderms. This variant is found on open coasts or offshore, and is characterised by the cup-coral [Caryophyllia smithii], [Alcyonium digitatum], the sea urchin [Echinus esculentus], large specimens of the sponge [Cliona celata], encrusting bryozoans and encrusting red algae. Although this variant tends to occur in deep water (depth range of 20-30m), a high degree of water clarity allows some red algae to grow at these depths. Other species recorded include large specimens of [Haliclona viscosa], the bryozoans [*Parasmittina trispinosa*], [Porella compressa] and [Pentapora foliacea], the sea cucumbers [Holothuria forskali] and [Aslia lefevrei] and sparse hydroids such as [Abietinaria abietina], [Nemertesia antennina], [Nemertesia ramosa] and [Halecium halecinum]. Anemones such as [Corynactis viridis], [Sagartia elegans] and [Urticina felina] are also frequently seen. Various other species characteristic of wave-exposed rock include the sponges [Pachymatisma johnstonia], [Stelligera stuposa], the starfish [Luidia ciliaris], [Marthasterias glacialis], [Asterias rubens], [Henricia oculata], the crinoid [Antedon bifida], the barnacle [Balanus crenatus], the top shell [Calliostoma zizyphinum] and the polychaete [Pomatoceros triqueter]. The majority of the records within this variant originate from the west coast of Ireland.

Situation: Exposed kelp forest and park biotopes such as LhypR with species such as [Laminaria hyperborea] are typically found shallower than this biotope. Deeper, this biotope is believed to graduate into PhaAxi (deep erect sponges), as both these biotopes are common around the west coast of Ireland.

A5.141
SS.SCS.CCS.PomB
[Pomatoceros triqueter] with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles
Website: **http://eunis.eea.europa.eu/habitats/2097** (March 2011)

This biotope is characterised by a few ubiquitous robust and/or fast growing ephemeral species which are able to colonise pebbles and unstable cobbles and slates which are regularly moved by wave and tidal action. The main cover organisms tend to be restricted to calcareous tube worms such as [Pomatoceros triqueter] (or [P. lamarcki)], small barnacles including [Balanus crenatus] and [Balanus balanus], and a few bryozoan and coralline algal crusts. Scour action from the mobile substratum prevents colonisation by more delicate species. Occasionally in tide-swept conditions tufts of hydroids such as [Sertularia argentea] and [Hydrallmania falcata] are present. This biotope often grades into SMX.FluHyd which is characterised by large amounts of the above hydroids on stones also covered in [Pomatoceros] and barnacles. The main difference here is that SMX.FluHyd, seems to develop on more stable, consolidated cobbles and pebbles or larger stones set in sediment in moderate tides. These stones may be disturbed in the winter and therefore long-lived and fragile species are not found.

Situation: This biotope is found on exposed open coasts as well as at the entrance to marine inlets.

A5.146
n/a
Scallops on shell gravel and sand with some sand scour
Website: **http://eunis.eea.europa.eu/habitats/2712** (March 2011)

Proposed new unit. No description available.

A5.431
SS.SMx.IMx.CreAsAn
[Crepidula fornicata] with ascidians and anemones on infralittoral coarse mixed sediment
Website: **http://eunis.eea.europa.eu/habitats/5579** (March 2011)

Medium-coarse sands with gravel, shells, pebbles and cobbles on moderately exposed coasts may support populations of the slipper limpet [Crepidula fornicata] with ascidians and anemones. [C. fornicata] is common in this biotope though not as abundant as in the muddier estuarine biotope CreMed to which this is related. Anemones such as [Urticina felina] and [Alcyonium digitatum] and ascidians such as [Styela clava] are typically found in this biotope. Bryozoans such as [Flustra foliacea] are also found along with polychaetes such as [Lanice conchilega]. Little information is available with regard the infauna of this biotope but given the nature of the sediment the infaunal communities are liable to resemble those

in biotopes from the SCS habitat complex. As with FluHyd this biotope could be considered a superficial or epibiotic overlay but more data is required to support this.

A5.4411
SS.SMx.CMx.ClloMx.Nem
[Cerianthus lloydii] with [Nemertesia] spp. and other hydroids in circalittoral muddy mixed sediment
Website: **http://eunis.eea.europa.eu/habitats/5583** (March 2011)

In sheltered muddy sandy gravel with appreciable quantities of surficial cobbles, pebbles and shells a community similar to ClloMx may develop with frequent [Cerianthus lloydii] and other burrowing anemones. However, the pebbles and cobbles embedded in the sediment are colonised by hydroids and in particular [Nemertesia antennina] and [N. ramosa]. Other hydroids may include [Kirchenpaueria pinnata] and [Halecium halecinum] whilst ascidians such as [Ascidiella aspersa] or [Corella parallelogramma] may also be present locally. [Pecten maximus] and [Pomatoceros triqueter] may also be frequent in certain areas.

A5.445
SS.SMx.CMx.OphMx
[Ophiothrix fragilis] and/or [Ophiocomina nigra] brittlestar beds on sublittoral mixed sediment
Website: **http://eunis.eea.europa.eu/habitats/5587** (March 2011)

Circalittoral sediment dominated by brittlestars (hundreds or thousands m-2) forming dense beds, living epifaunally on boulder, gravel or sedimentary substrata. [Ophiothrix fragilis] and [Ophiocomina nigra] are the main bed-forming species, with rare examples formed by [Ophiopholis aculeate]. Brittlestar beds vary in size, with the largest extending over hundreds of square metres of sea floor and containing millions of individuals. They usually have a patchy internal structure, with localized concentrations of higher animal density. [Ophiothrix fragilis] or [Ophiocomina nigra] may dominate separately or there may be mixed populations of the two species. [Ophiothrix] beds may consist of large adults and tiny, newly-settled juveniles, with animals of intermediate size living in nearby rock habitats or among sessile epifauna. Unlike brittlestar beds on rock, the sediment based beds may contain a rich associated epifauna (Warner, 1971; Allain, 1974; Davoult & Gounin, 1995). Large suspension feeders such as the octocoral [Alcyonium digitatum], the anemone [Metridium senile] and the hydroid [Nemertesia antennina] are present mainly on rock outcrops or boulders protruding above the brittlestar-covered substratum. The large anemone [Urticina feline] may be quite common. This species lives half-buried in the substratum but is not smothered by the brittlestars, usually being surrounded by a 'halo' of clear space (Brun, 1969; Warner, 1971). Large mobile animals commonly found on Ophiothrix beds include the starfish [Asterias rubens], [Crossaster papposus] and [Luidia ciliaris], the urchins [Echinus esculentus] and [Psammechinus miliaris], edible crabs [Cancer pagurus], swimming crabs [Necora puber], [Liocarcinus] spp., and hermit crabs [Pagurus bernhardus]. The underlying sediments also contain a diverse infauna including the bivalve [Abra alba]. Warner (1971) found that numbers and biomass of sediment dwelling animals were not significantly reduced under dense brittlestar patches.

PRIMER Defined EUNIS Variations

CLUSTER FCJ

This cluster shows a potential transitional biotope From **A4.132** to **A4.215.** Potentially indicative of Echinus esculentus grazing but in insufficient numbers to convert fully into the low diversity grazed **A4.215** biotope.

A4.132
CR.HCR.XFa.CvirCri
[Corynactis viridis] and a mixed turf of crisiids, [Bugula], [Scrupocellaria], and [Cellaria] on moderately tide-swept exposed circalittoral rock
Website: **http://eunis.eea.europa.eu/habitats/2096** (March 2011)

This biotope typically occurs on wave-exposed, vertical or steep, circalittoral bedrock or large boulders, usually subject to moderate or strong tidal streams. It is characterised by dense aggregations of the anemone [Corynactis viridis] and the cup coral [Caryophyllia smithii] intermixed with a short bryozoan turf of one or more [Crisia] spp., [Scrupocellaria] spp., [Bugula] spp. and [Cellaria] spp. Occasionally, this turf obscures the underlying [C. virdis] and [C. smithii]. Cushion and encrusting sponges, particularly [Pachymatisma johnstonia], [Cliona celata], [Esperiopsis fucorum] and [Dysidea fragilis], are present in moderate amounts at many sites. The axinellid sponges [Stelligera] spp. and [Raspailia] spp. are less frequently recorded. Clumps of large hydroids such as [Nemertesia antennina] and [Nemertesia ramosa] as well as the soft coral [Alcyonium digitatum] and the bryozoan [Alcyonidium diaphanum] may be found covering the hard substratum. The anemones [Actinothoe sphyrodeta] and [Sagartia elegans] are typically present in low numbers, while the hard `coral' [Pentapora foliacea] is also occasionally observed. The most frequently recorded echinoderms are [Marthasterias glacialis] and [Asterias rubens], although other species such as [Echinus esculentus] may also be seen. The rocky substratum may have a patchy covering of encrusting red seaweeds/algae. The crabs [Necora puber] and [Cancer pagurus] may be seen in crevices or under overhangs. This biotope is regularly recorded around south west England and Wales, often on vertical rock faces.

Cluster FCJ is close except for notable [Gymnangium montagui] patches and frequent [Echinus esculenta] (more so than other Echinoderms) which agree better with **A4.215**

A4.215
CR.MCR.EcCr.AdigVt
[Alcyonium digitatum] and faunal crust communities on vertical circalittoral bedrock
Website: **http://eunis.eea.europa.eu/habitats/5592** (March 2011)

This biotope typically occurs on the vertical faces and overhangs of exposed to moderately exposed lower infralittoral and upper circalittoral bedrock subject to moderately strong to weak tidal streams. Due to the large numbers of the urchin [Echinus esculentus] often recorded, this biotope tends to have a grazed appearance, and the bedrock is often encrusted with pink coralline algae, encrusting bryozoans such as [*Parasmittina trispinosa*] and the calcareous tubeworm [Pomatoceros triqueter]. Dense aggregations of dead mans fingers [Alcyonium digitatum] may be present along with the cup coral [Caryophyllia smithii]. Other species present include the echinoderms [Asterias rubens], [Ophiothrix fragilis] and [Antedon bifida], the ascidians [Clavelina lepadiformis], [Ciona intestinalis] and [Ascidia mentula], the anthozoans [Urticina feline], [Cortynactis viridis], [Metridium senile] and [Sagartia elegans], the gastropod [Calliostoma zizyphinum] and the crustacean [Cancer pagurus]. Three regional variations of this biotope have been recorded. One variant found typically off the north-east coast of Scotland and around the Northern Isles, has a very impoverished appearance dominated by anthozoans. A second variant occurs along the west coast of Scotland, extending to Rockall in the west, and the Northern Isles in the north-east, and has a more fauna, characterised by hydroids, sponges, anthozoans and echinoderms. A third variant occurs along the north-east coast of England (Northumberland) up to the Northern Isles and is dominated by [Alcyonium digitatum], brittlestars and [Echinus esculentus].

In **Cluster FCJ** the bedrock not completely grazed, but it could be in transition to this biotope. Corynactis viridis is present as in **A4.132** "with other encrustations often obscuring their presence". Occasional cushion sponges such as [Pachymatisma johnstonia], [Cliona celata], are also better in keeping with **A4.132**.

Video Defined EUNIS Biotopes

A4.12
CR.HCR.DpSp
Sponge communities on deep circalittoral rock
Website: **http://eunis.eea.europa.eu/habitats/5417** (March 2011)

This habitat type typically occurs on deep (commonly below 30m depth), wave-exposed circalittoral rock subject to negligible tidal streams. The sponge component of this biotope is the most striking feature, with similar species to the bryozoan and erect sponge habitat type (A4.131) although in this case, the sponges [Phakellia ventilabrum], [Axinella infundibuliformis], [Axinella dissimilis] and [Stelligera stuposa] dominate. Other sponge species frequently found on exposed rocky coasts are also present in low to moderate abundance. These include [Cliona celata], [Polymastia boletiformis], [Haliclona viscosa], [Pachymatisma johnstonia], [Dysidea fragilis], [Suberites carnosus], [Stelligera rigida], [Hemimycale columella] and [Tethya aurantium]. The cup coral [Caryophyllia smithii] and the anemone [Corynactis virdis] may be locally abundant in some areas, along with the holothurian [Holothuria forskali]. The soft corals [Alcyonium digitatum] and [Alcyonium glomeratum] are frequently observed. The bryozoans [Pentapora foliacea] and [Porella compressa] are also more frequently found in this deep-water habitat type. Bryozoan crusts such as [*Parasmittina trispinosa*] are also occasionally recorded. Isolated clumps of large hydroids such as [Nemertesia antennina], [Nemertesia ramosa] and [Sertularella gayi] may be seen on the tops of boulders and rocky outcrops. Large echinoderms such as [Echinus esculentus], [Luidia ciliaris], [Marthasterias glacialis], [Strichastrella rosea], [Henricia oculata] and [Aslia lefevrei] may also be present. The sea fan [Eunicella verucosa] may be locally common but to a lesser extent than in A4.1311. The top shell [Calliostoma zizyphinum] is often recorded as present.

Seen in transects Ed11 and Ed16.

A4.213
CR.MCR.EcCr.UrtScr
[Urticina felina] and sand-tolerant fauna on sand-scoured or covered circalittoral rock
Website: **http://eunis.eea.europa.eu/habitats/2120** (March 2011)

This biotope typically occurs on tide-swept circalittoral bedrock, rock adjacent to mobile sand/gravel in gullies, and cobbles on gravel and sand, characterised by scour-tolerant robust species. Although many of these species are found on subtidal rock, they tend to occur in larger numbers in these highly sand-influenced conditions. The dominant species by far is the anemone [Urticina felina] which commonly occurs on rocks at the sand-rock interface, where the scour levels are at a maximum and few species can tolerate this abrasion. The sponge [Ciocalypta penicillus] is also very characteristic of shifting sand-covered rock. This biotope is only occasionally recorded as a separate entity, because its extent is typically restricted to a very narrow band of rock at the sediment interface. Only occasionally does it cover a large extent of rock (e.g. where the wave action is strong enough to cause sand abrasion well up the rock face or where the rock is low-lying). More often, this scoured zone is recorded as part of whatever biotope occurs on the nearby hard substrata. Other species (which are able to survive, and benefit from the reduced competition) include [Balanus crenatus], [Pomatoceros triqueter], [Cellepora pumicosa], [Alcyonidium diaphanum], [Cliona celata], encrusting red algae and [Asterias rubens].
Situation: This biotope tends to be found in close proximity to mobile sand or gravel, producing scour that tends to limit the number of species found.

Seen in transects pp22 and pp24.

A3.113
IR.HIR.KFaR.LhypFa
[Laminaria hyperborea] forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock
Website: **http://eunis.eea.europa.eu/habitats/1995** (March 2011)

Very exposed and exposed, but wave-surged, upper infralittoral bedrock and massive boulders characterised by a dense forest of the kelp [Laminaria hyperborea] with a high diversity of seaweeds and invertebrates. The shallowest kelp plants are often short or stunted, while deeper plants are taller with heavily epiphytised stipes with foliose red seaweeds such as [Delesseria sanguinea], [Cryptopleura ramosa] or [Plocamium cartilagineum] or even the brown seaweed [Dictyota dichotoma]. Also found on the stipes or on the rock below the canopy are red seaweeds including [Phycodrys rubens], [Kallymenia reniformis], [Callophyllis laciniata, Caryophyllia smithii], and [Corallina officinalis], while encrusting coralline algae can cover any bare patches of rock. At some sites the red seaweeds can be virtually mono-specific, while at other sites show considerable variation containing a dense mixed turf of a large variety of species. The red seaweed [Odonthalia dentata] can be present in the north. The faunal and floral under-storey is generally rich in species due, in part, to the relatively low urchin-grazing pressure in such shallow exposed conditions. The faunal composition of this biotope varies markedly between sites, but commonly occurring are the soft coral [Alcyonium digitatum] and the anthozoans [Sagartia elegans] and [Corynactis viridis]. Sponges form a prominent part of the community with variable amounts of the sponges [Halichondria panicea] and [Pachymatisma johnstonia] and several other species. The crab [Cancer pagurus] and the starfish [Asterias rubens] are normally present in small numbers foraging beneath the canopy, while the sea urchins [Echinus esculentus] and [Urticina felina] graze on the seaweeds. The hydroid Obelia geniculata, the ascidian Botryllus schlosseri and the bryozoan Membranipora membranacea compete for space on the kelp, whereas the bryozoan Electra pilosa also can be found on foliose red seaweeds. Situation: This kelp forest most commonly occurs beneath a zone of [Alaria] [esculenta] and [Mytilus] [edulis] (Ala.Myt) and may contain small patches of [A. esculenta]. As the force of the wave-surge diminishes with increased depth, density of the faunal turf reduces and the kelp forest or park changes to one characterised by kelp and dense red seaweeds (LhypR.Ft or LhypR.Pk). In some areas of Shetland and St Kilda the lower infralittoral zone is characterised by a park of the kelp [Laminaria saccharina] and/or [Saccorhiza polyschides] (LsacSac). Where the [L. hyperborea] forest continues to depths of 15 m or greater it may give way to a zone of dense foliose red algae (FoR or For.Dic).

Seen in transect ed02.

A5.53
SS.SMp.SSgr
Sublittoral seagrass beds
Website: **http://eunis.eea.europa.eu/habitats/5438**

Beds of submerged marine angiosperms in the genera [Cymodocea], [Halophila], [Posidonia], [Ruppia], [Thalassia], [Zostera].

Seen in transect 9a.

Biotopes by region

Plymouth Sound to Prawle Point
Constituent Biotopes

A3.1161 Foliose red seaweeds with dense [Dictyota dichotoma] and/or [Dictyopteris membranacea] on exposed lower infralittoral rock
A3.116 Foliose red seaweeds on exposed lower infralittoral rock
A4.13 Mixed faunal turf communities on circalittoral rock
A4.1311 Eunicella verrucosa and Pentapora foliacea on wave exposed circalittoral rock
A4.2122 [Caryophyllia smithii] and sponges with [Pentapora foliacea], [Porella compressa] and crustose communities on wave-exposed circalittoral rock
A4.213 [Urticina felina] and sand-tolerant fauna on sand-scoured or covered circalittoral rock
A5.242 Scallops on shell gravel with some sand scour
A5.445 [Ophiothrix fragilis] and/or [Ophiocomina nigra] brittlestar beds on sublittoral mixed sediment
Cluster FCJ A4.132/A4.215 Transition from [Corynactis viridis] and a mixed turf of crisiids, [Bugula], [Scrupocellaria], and [Cellaria] on moderately tide-swept exposed circalittoral rock to [Alcyonium digitatum] and faunal crust communities on vertical circalittoral bedrock
Sand

Eddystone
Constituent Biotopes

A3.113 [Laminaria hyperborea] forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock
A3.1311 [Eunicella verrucosa] and [Pentapora foliacea] on wave-exposed circalittoral rock
A4.12 Sponge communities on deep circalittoral rock
A4.132 [Corynactis viridis] and a mixed turf of crisiids, [Bugula], [Scrupocellaria], and [Cellaria] on moderately tide-swept exposed circalittoral rock
A5.141 [Pomatoceros triqueter] with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles
Coarse Sand

Prawle Point to Start Point Biotopes
Constituent Biotopes

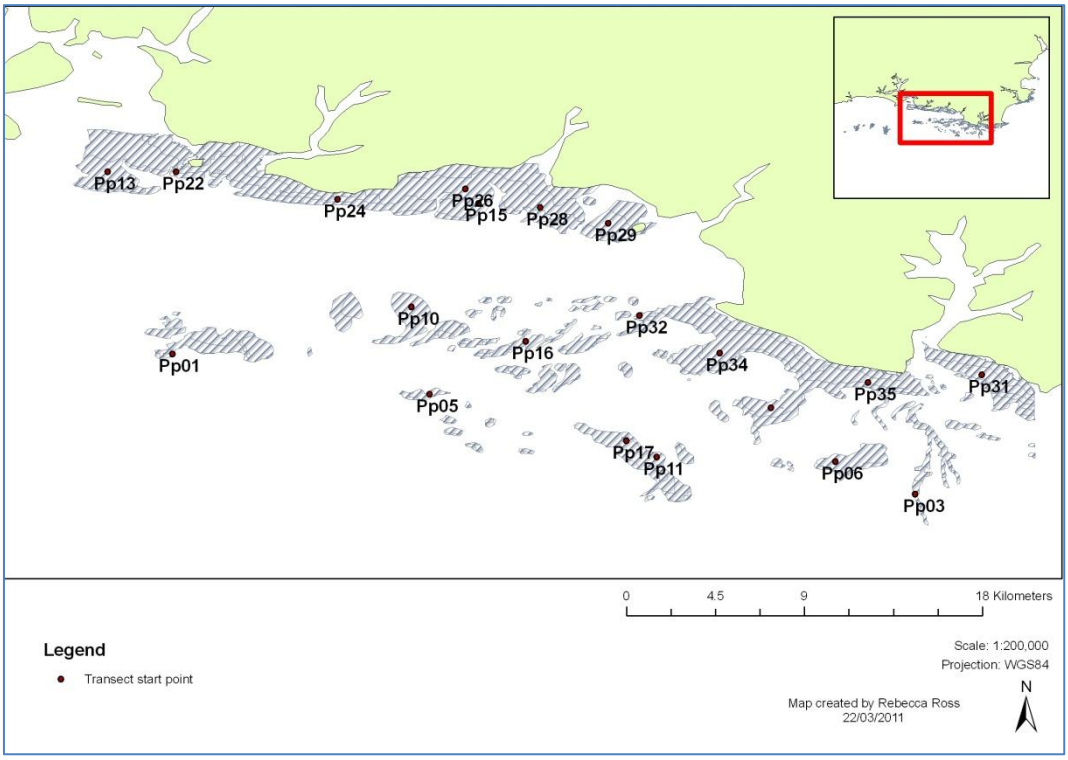
A3.113 [Laminaria hyperborea] forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral
A3.116 Foliose red seaweeds on exposed lower infralittoral rock
A4.13 Mixed faunal turf communities on circalittoral rock
A4.213 [Urticina felina] and sand-tolerant fauna on sand-scoured or covered circalittoral rock
A5.141 [Pomatoceros triqueter] with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles
A5.445 [Ophiothrix fragilis] and/or [Ophiocomina nigra] brittlestar beds on sublittoral mixed sediment
Gravel Dunes communities
Coarse Sand communities
Sand communities

Mackerel Cove to Dartmouth Reefs
Constituent Biotopes
A3.12 Sediment-affected or disturbed kelp and seaweed communities

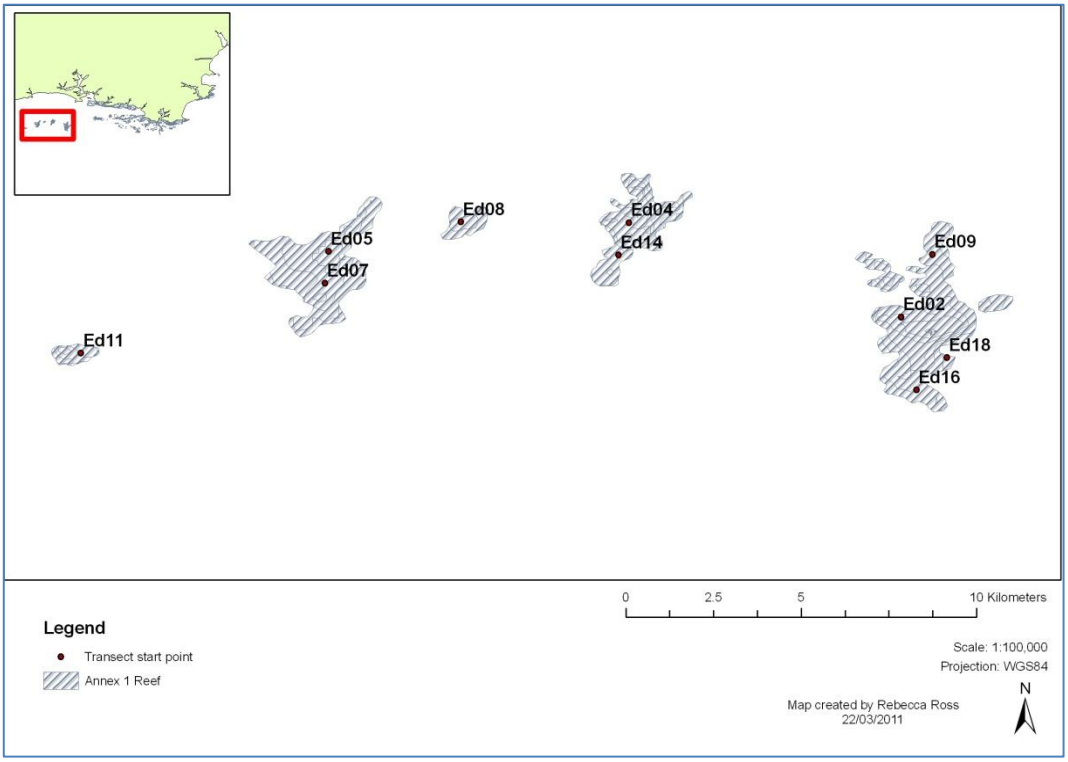
A4.13 Mixed faunal turf communities on circalittoral rock
A5.141 [Pomatoceros triqueter] with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles
A5.146 Scallops on shell gravel and sand with some sand scour
A5.431 [Crepidula fornicata] with ascidians and anemones on infralittoral coarse mixed sediment
A5.4411 [Cerianthus lloydii] with [Nemertesia] spp. and other hydroids in circalittoral muddy mixed sediment
A5.53 Sublittoral seagrass beds
Coarse sand communities
Sand communities
Rippled sand communities
Mud communities

Appendix 6 Transect Locations

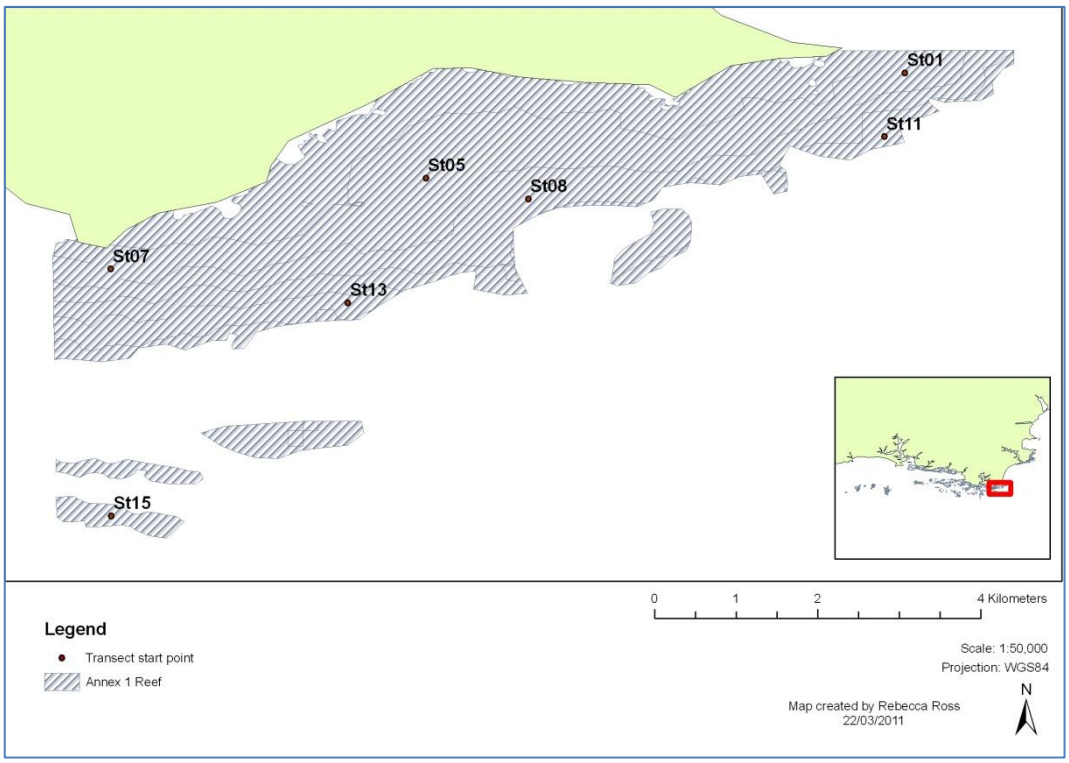
Appendix Figure D Plymouth Sound to Prawle Point Reefs: Transect locations



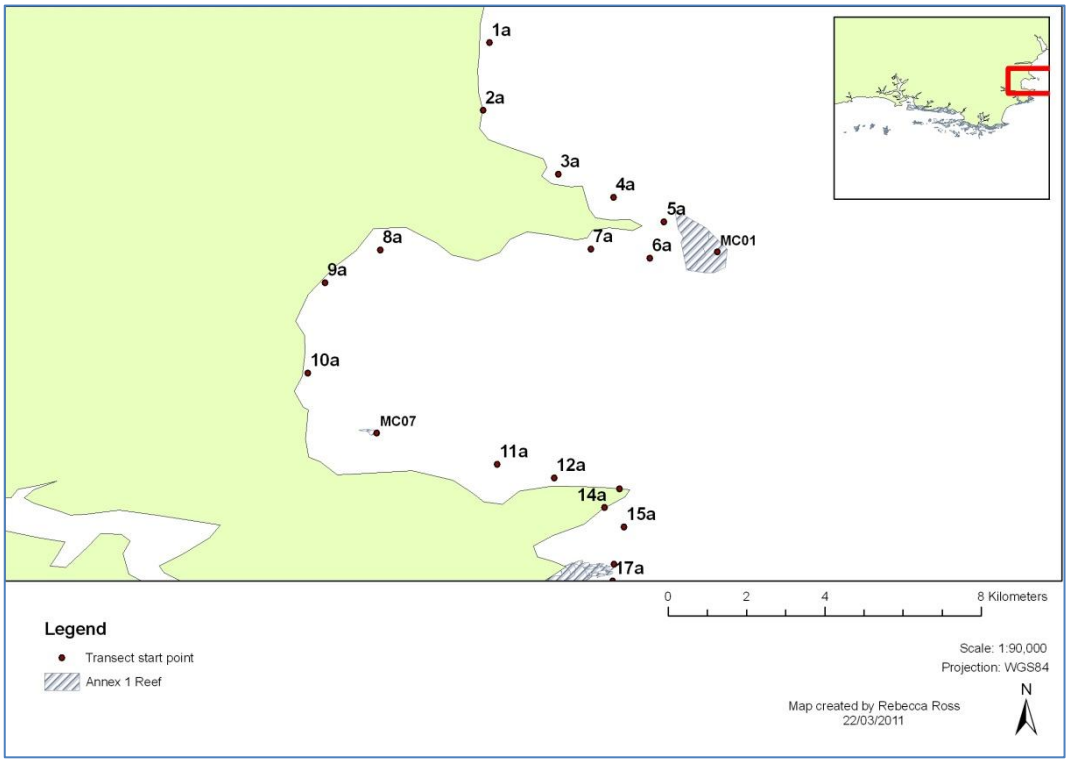
Appendix Figure E Eddystone Reefs: Trasect locations



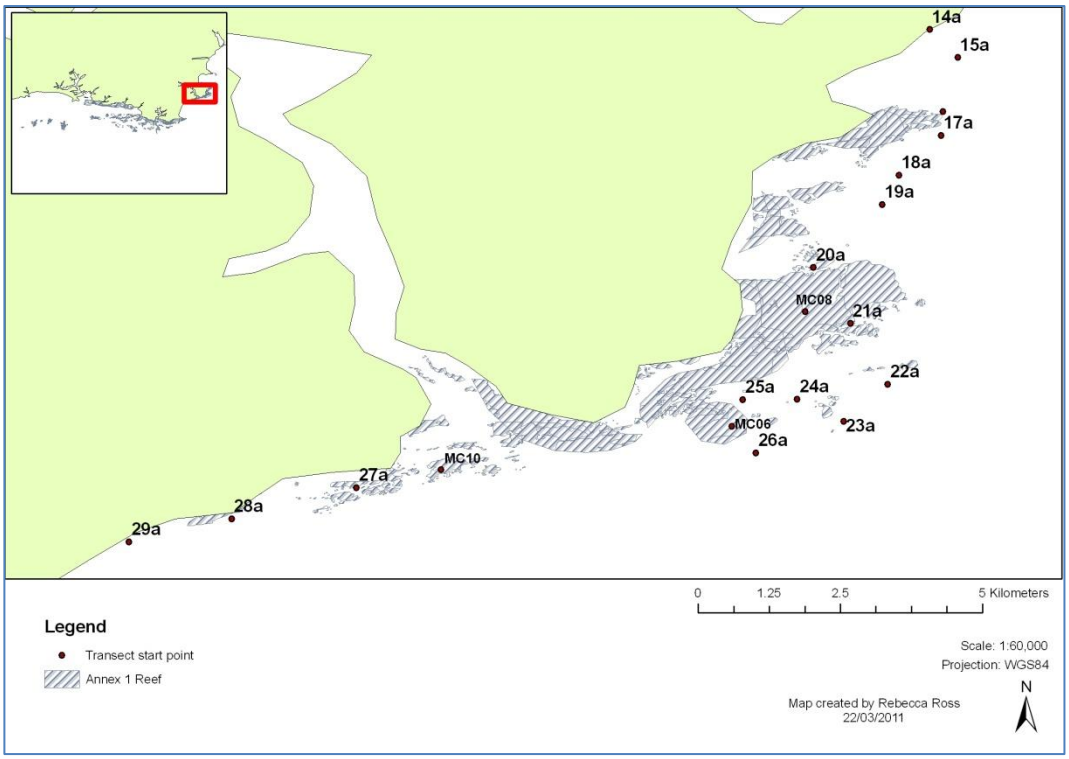
Appendix Figure F Prawle Point to Start Point Reefs: Transect locations



Appendix Figure G Mackerel Cove to Dartmouth Reefs (a): Transect locations between Mackerel Cove and Berry Head

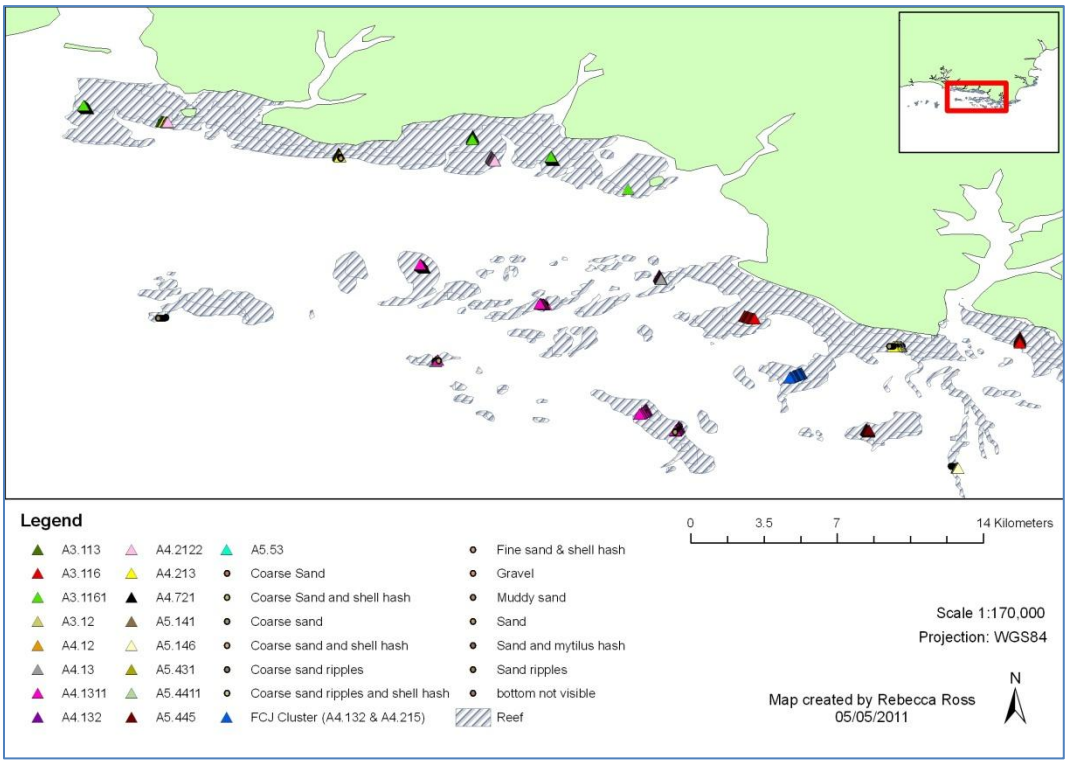


Appendix Figure H Mackerel Cove to Dartmouth Reefs (b): Transect locations between Berry Head and Dartmouth

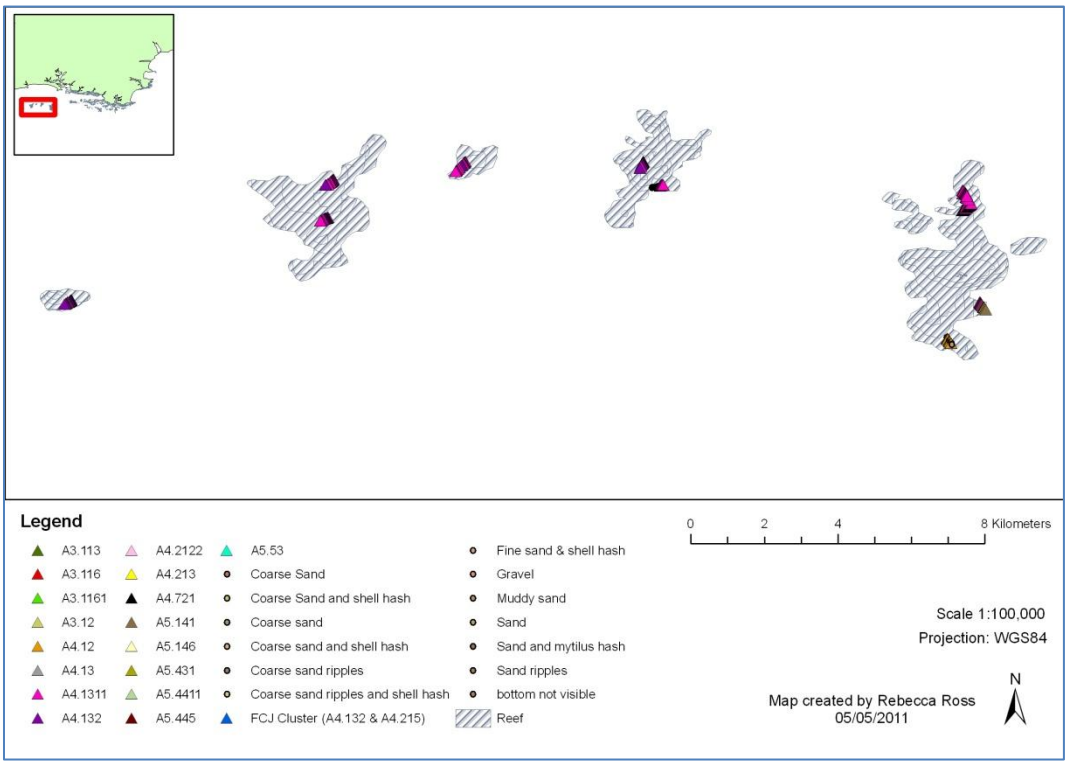


Appendix 7 Transect Biotopes

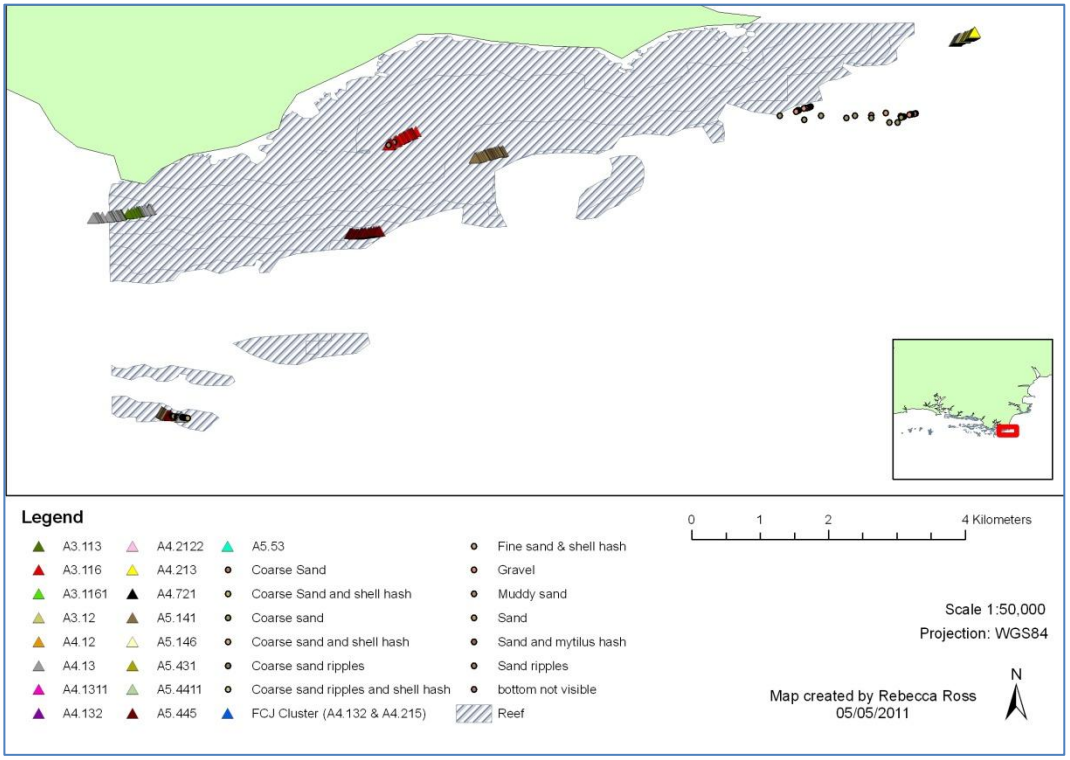
Appendix Figure I Biotope Mapped Transects between Prawle Point and Plymouth Sound



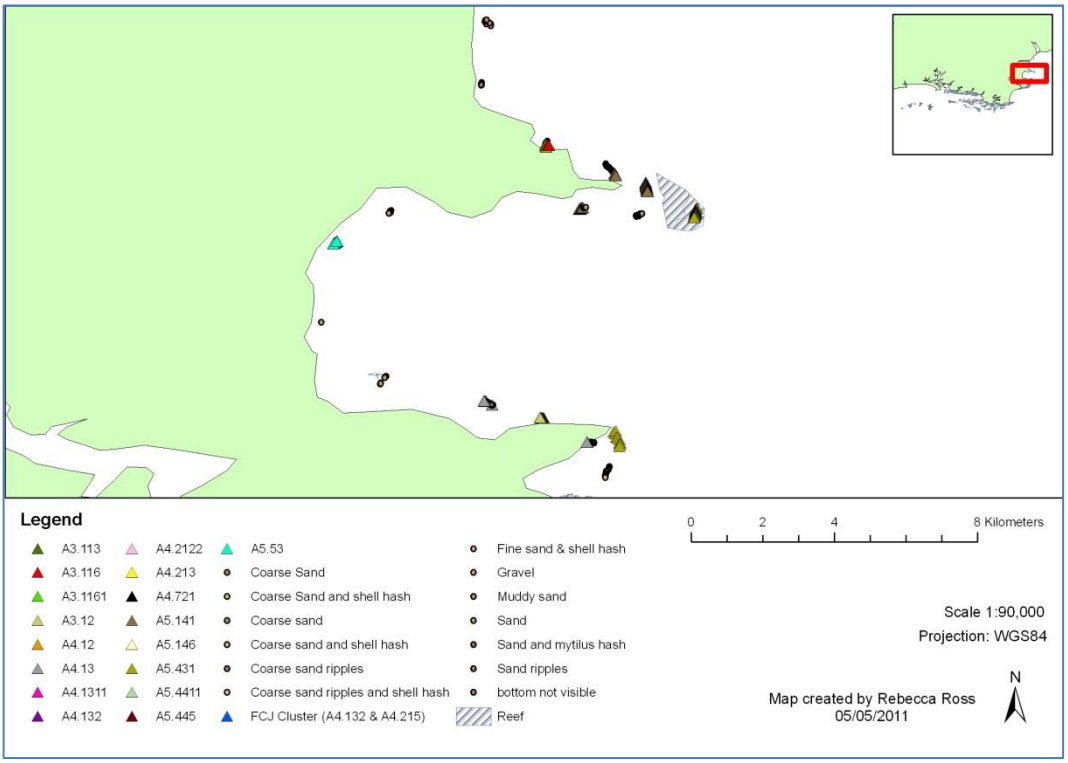
Appendix Figure J Biotope mapped transects at Eddystone Reefs



Appendix Figure K Biotope mapped transects between Prawle Point and Start Point.



Appendix Figure L Biotope mapped transects between Mackerel Cove and Berry Head



Appendix Figure M Biotope mapped transects between Berry Head and Dartmouth Reefs