

Scottish Natural Heritage

# Commissioned Report 345

Biotope Mapping and Survey of the Treshnish Isles Candidate  
Special Area of Conservation (cSAC)





# COMMISSIONED REPORT

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**Commissioned Report No. 345**

## **Biotope Mapping and Survey of the Treshnish Isles Candidate Special Area of Conservation (cSAC)**

For further information on this report please contact:

Laura Clark  
Scottish Natural Heritage  
Great Glen House  
INVERNESS  
IV3 8NW  
Telephone: 01463 725237  
E-mail: [laura.clark@snh.gov.uk](mailto:laura.clark@snh.gov.uk)

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## COMMISSIONED REPORT

# Summary

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## **Biotope Mapping and Survey of the Treshnish Isles Candidate Special Area of Conservation (cSAC)**

**Commissioned Report No. 345**

**Contractor: ERT**

**Year of publication: 2009**

### **Background**

ERT (Scotland) Ltd (ERT) was contracted by Scottish Natural Heritage (SNH) to undertake broad scale intertidal and subtidal biotope mapping of the Treshnish Isles cSAC. The aim of this project was to survey the intertidal and subtidal areas of the cSAC, and to provide a comprehensive broad scale biotope distribution map of the area. Other objectives of the work were to commission aerial photography to assist in mapping, to review existing marine biological information, and to compile the data and outputs into a geographic information system (GIS) project.

Aerial photography of the Treshnish Isles took place on 15 June 2003, at low water spring tides. The aerial photographs were scanned and a mosaic image made up for geo-rectification and display within a GIS environment.

The subtidal survey took place over the period 5-9 August 2003. The acoustic technique used in the present study was a RoxAnn Acoustic Ground Discrimination System (AGDS). Ground truth information on the nature of the seabed was obtained to interpret the AGDS data, using a drop-down/towed video system.

Intertidal fieldwork took place over the seven-day period 11-17 August 2003. Most of the shoreline was walked and directly observed by the survey teams, although some sections were mapped from the top of the backing cliffs. The observed biotope distribution was drawn directly onto aerial photographs, onto which OS Landline data had been superimposed.

### **Main findings**

- A small area on the eastern edge of the cSAC was deeper than the 60m lower depth limit of the RoxAnn system used, and the power of the sounder was manually increased during the survey to obtain records below this depth. In addition, this area was also deeper than the limit of the drop-down camera system used so the interpretation of AGDS data below this depth must be further viewed with caution.

- From the shoreline, the seabed falls away rapidly and most of the cSAC around the Treshnish Isles lies at a depth of 25-30m below chart datum. Amongst the islands, there is an extensive shallows lying between Lunga and Fladda, where the seafloor lies between 0 and 10m depth and is punctuated by numerous islets, rocks and barely submerged reefs. At the southeastern edge of the cSAC, within 1km of the islands, the seafloor begins to slope away very steeply to water depths of 100m below chart datum.
- In terms of seabed type, most of the cSAC consists of an almost level plain of cobble, gravel and sand lying at 25-35m below chart datum. Amongst the islands, patches of sediment occur in the shallows between Fladda and Lunga, ranging in nature from medium fine sands to maerl gravel. The nature of the deep seabed along the eastern edge of the cSAC is unknown, but is predicted to vary between rock and coarse sand depending upon location.
- The shores of the Treshnish Isles were predominantly open, rocky and steep, exposed to the south and west, and moderately exposed on the east and north. Apart from boulders and cobbles, intertidal sediment was rare. There were two sizeable inlets on the island of Fladda; the south-facing one contained sheltered cobble and boulder habitats, and had a small freshwater stream at its head. The north-facing inlet was wider and flatter, and contained a central area of coarse sand in the lower shore.
- A total of 19 biotopes or higher habitat categories were identified from the video records. Around the rocky coastline, and within a depth range of 0-23m below chart datum, biotopes were mainly kelp-dominated. These mainly comprised mixed *Laminaria hyperborea* and *L. saccharina*, but included other brown algae such as *Desmarestia aculeata* and *Dictyota dichotoma* in addition to various unidentified red algae. Areas of kelp park occurred in deeper water slightly further offshore to a maximum depth of approximately 23m. Rock surfaces had a covering of *Pomatoceros triqueter* and *Balanus* spp. together with a variable coverage of encrusting coralline algae. In the channels between the islands, well-developed maerl beds were found to cover a significant area. In addition, a dense bed of *Zostera marina* was found beneath the boat anchorage.
- Over the wider cSAC, the most frequently and widely recorded circalittoral biotopes from the video samples were ECR.PomByC and CGS. As in the rocky infralittoral, the predominant taxa on cobbles and boulders were *P. triqueter* and *Balanus* spp. together with a variable coverage of encrusting coralline algae. The nature of the species and biotopes present on sublittoral hard substrata was indicative of widespread sediment influence, scour or mobility, induced by wave action and tides. The sandy and gravelly biotopes appeared almost barren.
- A total of 33 biotopes and sub-biotopes was identified during the intertidal survey, from approximately 25km of coastline. Overall, the shores were characterised by barnacle and furoid-dominated communities. Of the biotopes found, the most ubiquitous were the lichen-dominated biotopes in the supralittoral and upper shore habitats, and kelp-dominated biotopes in the sublittoral fringe. The mid-shore zones tended to be occupied by one or more of ELR.BPat.FvesI, ELR.BPat.Sem and MLR.FvesB.
- On the less exposed eastern shores, or in areas of shelter, fucoids became more prominent and communities dominated by *Fucus spiralis*, *F. serratus* and *Ascophyllum nodosum* were occasionally recorded.

- There are no other published marine biological data for the Treshnish Islands, though these results generally tie in with what is known from previous survey work in the inner Hebrides and Scottish west coast.
- Records of note include *Fucus vesiculosus* f. *linearis* and *Fucus ceranoides* intertidally, and the presence of a network of maerl beds and a bed of *Zostera marina* subtidally.

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*For further information on this project contact:*

**Laura Clark, SNH, GGH, Leachkin Road, Inverness, IV3 8NW Tel: 01463 725237**

*For further information on the SNH Research & Technical Support Programme contact:*

*DSU (Policy & Advice Directorate), Scottish Natural Heritage, Great Glen House, Inverness, IV3 8NW.*

*Tel: 01463 725000 or pads@snh.gov.uk*

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## 1 INTRODUCTION

ERT (Scotland) Ltd (ERT) was contracted by Scottish Natural Heritage (SNH) to undertake broad scale intertidal and subtidal biotope mapping of the Treshnish Isles candidate Special Area of Conservation (cSAC).

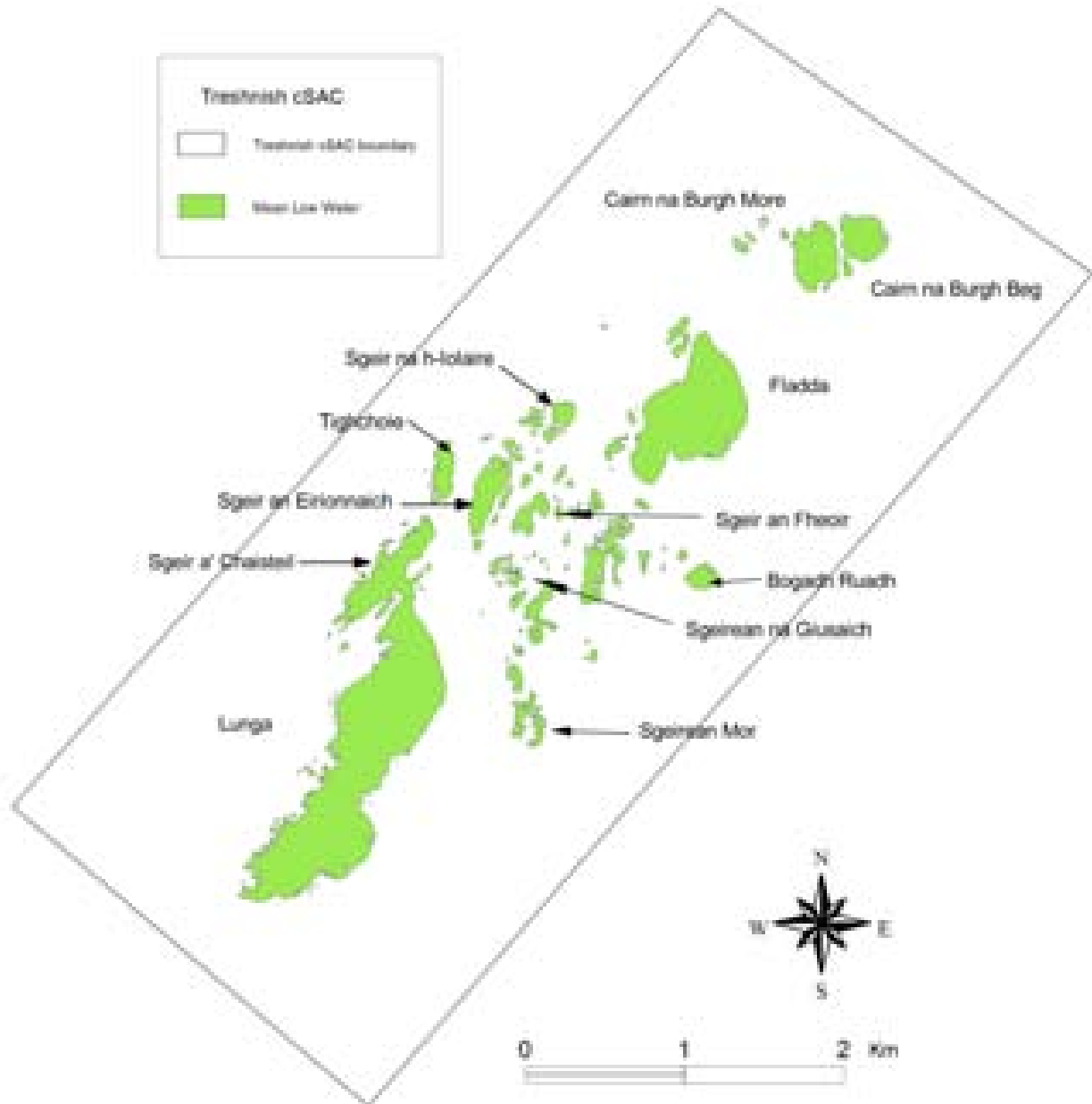
The Treshnish Isles are a cSAC under the European Habitats Directive (92/43/EEC). The main marine features of interest for which it has been designated are the internationally important breeding colony of grey seals *Halichoerus grypus*, and the rocky reefs that fringe 90% of its coastline.

The aim of this project was to survey the intertidal and subtidal zones of the cSAC to provide a broad scale biotope distribution map for the area. A map of the Treshnish Isles showing the boundary of the cSAC and the names of the larger islands and skerries mentioned later in this report, is shown in Figure 1.1.

The specific objectives of the work were:

- to review existing information relating to the intertidal and subtidal regions of the Treshnish Isles;
- to commission aerial photography of the cSAC area at a suitable low water spring tide for use in biotope mapping studies;
- to undertake a broad scale intertidal and subtidal habitat/biotope mapping survey of the islands;
- to compile a report of the survey work with maps showing the distribution of biotopes around the island;
- to compile the data and outputs into a Geographic Information System (GIS) project that is compatible with the SNH ArcView GIS.

Figure 1.1 - The location of the Treshnish Isles and the outer boundary of the cSAC, Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))



## 2 PREVIOUS INFORMATION FOR THE TRESHNISH ISLES

The Treshnish Isles are a remote chain of uninhabited islands and skerries located in the Inner Hebrides between the islands of Coll and Mull in southwest Scotland. The archipelago lies, at its closest, just 3km west of Mull and extends along a northeast to southwest axis for a distance of 11km. There are eight principal islands of which the largest, the Dutchman's Cap, is not a part of the cSAC and is therefore not considered further in this report.

The Treshnish Isles are rocky, with cliffs, screes and raised beaches, and support strongly maritime grassland and heath. The islands are formed from basaltic lava and have been influenced by successive glaciations and changes in sea level. These processes have left the islands with their present characteristic appearance, with fossil beaches separated by sheer cliffs (Figure 2.1), which often have ancient sea caves high above the current sea level.

*Figure 2.1 – View of Lunga from the southeast, Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))*



The cSAC comprises six main islands and several smaller islets, skerries and reefs in the shallows between Lunga and Fladda, and has a coastline characterised by low cliffs and steep rocky shores. The south and west coasts of the archipelago are subject to a wave fetch extending across the whole of the north Atlantic, whilst the north and east coasts are more sheltered by their aspect and proximity to the mainland.

The islands are of national importance for their breeding seabird colonies, especially for the storm petrel *Hydrobates pelagicus*. The Treshnish Isles are also of international importance as a traditional wintering locality for the Greenland barnacle goose *Branta leucopsis*. In addition, the islands, numerous skerries, islets and reefs support an internationally important breeding colony of grey seals *Halichoerus grypus*, contributing approximately 3% of the annual UK grey seal pup production.

There is no marine biological information published for the site, though information on marine biological work carried out elsewhere in this part of west Scotland is summarised in Connor & Little (1998).

Information on the offshore benthos is sparse, with much of the knowledge available coming from non-biological investigations, including the geological work of Eden *et al.* (1971) and the sedimentary studies of Farrow *et al.* (1978). Eden *et al.* undertook surveys from a manned submersible in the Firth of Lorne and on the Stanton and Blackstones Banks (the latter some 180 and 110km west of Colonsay respectively). These two offshore banks are probably the sites most closely comparable to the subtidal area of the Treshnish cSAC of any previous studies, in terms of both locality and exposure. Sparse brittlestar populations (*Ophiothrix fragilis* and *Ophiocomina nigra*) were present on Stanton Bank, whilst the bryozoan *Pentapora foliacea* was observed on the Blackstones Bank. Farrow *et al.* (1978) found that seabed sediments around the inner Hebridean islands had a very high calcareous content, due to the remains of barnacles, molluscs, maerl, echinoids and foraminiferans. They also showed that the calcareous content increased with wave exposure, and that sediments around Tiree were composed of 80% carbonate whilst those in the Sound of Iona were composed completely of calcareous algae.

Powell *et al.* (1977) described a range of shores on the nearby island of Mull, and noted the occurrence of the southern brown algae *Cystoseira nodicaulis* and *C. tamariscifolia* on the west coast. Price & Tittley (1978a, 1978b) surveyed the algae around Mull in both the littoral and sublittoral. They noted the presence on exposed shores of *Fucus vesiculosus* f. *linearis*, and also of *Alaria esculenta* alongside *Laminaria* spp. in the sublittoral fringe. Smith (1983) surveyed the molluscan fauna of Tiree's shores and recorded 70 species, in addition to a population of the purple sea urchin *Paracentrotus lividus*, a species usually restricted to the southwest coasts of Britain and Ireland. The sublittoral zone of Tiree and the south coast of Coll were surveyed by Dipper (1981), who recorded that sediments were generally coarse sands and gravels, and also observed the anemone *Arachnanthus sarsi* for the first time in Britain. Dipper noted the exposed nature of the marine communities here, commenting that their richness was due to the lack of intense grazing by common sea urchins.

### **3 METHODS**

Survey work comprised three elements: aerial photography, subtidal survey and intertidal survey. The approach and methods used for each of these is detailed in the following sections.

#### **3.1 Aerial photography**

Aerial photography of the Treshnish Isles was undertaken by Flight Images LLP, based at Fairoaks airport near Woking, Surrey. The overflight of the islands took place on 15 June 2003, between 1300 and 1525 BST to coincide with the time of low water spring tides in the area at 1315. Some 84 frames were exposed using a vertically mounted Bronica medium format camera fitted with a 50mm lens (with a 52° horizontal angle of view). The filmstock was Fuji Provia 100F colour transparency film, rated at 1,000 lines per cm. The flight pattern during photography comprised three runs aligned along the main axis of the islands at an altitude of 2,400 feet above sea level (an approximation of the flight pattern is shown in Figure 3.1). With the lens type used and altitude flown, the ground area covered in each frame was 700m by 700m.

Once the film had been developed, the slides were scanned using a Minolta multi-scan Pro at 2,400 dpi and the individual tiles pieced together within Adobe PhotoShop 7 to create a single mosaic image of the islands. The aerial imagery was supplied in the form of the original transparencies (each 56 by 56mm), as well as a set of individual tiles as JPEG files, a mosaic JPEG file, and as a mosaic PhotoShop 7 file.

The mosaic image was then passed to Envision Mapping Ltd for geo-rectification and display within a GIS environment.



## 3.2 Subtidal

The primary acoustic technique used in the present study was a RoxAnn Acoustic Ground Discrimination System (AGDS) operating at 50kHz. This system is based on a single beam echo sounder and its use in broad scale mapping has been described by Foster-Smith & Sotheran (2003). In principle, it returns point values of seabed roughness (termed E1) and hardness (termed E2) from the boat track as the survey area is traversed. A complete coverage of an area can subsequently be interpolated from these track point data, and the resolution of a survey is primarily determined by the track spacing. Although AGDS are low-resolution systems, they can be used to discriminate seabed types and the digital data are readily handled by computer image processing software. Ground truth information on the nature of the seabed has to be obtained to interpret the AGDS data, and a drop-down/towed video system is often used for this purpose.

### 3.2.1 Fieldwork

Subtidal survey work was conducted by Envision Mapping LLP over the period 5-10 August 2003, and weather and sea conditions were good for the survey with no downtime incurred. The survey vessel was the *RV Serpula* operating out of Bunessan harbour, and travel time to and from the Treshnish Isles was approximately 1.5h each way. Thus working days typically extended from 0830-1930h. Positioning was by a Differentially corrected Geographical Positioning System (DGPS) receiver. AC power was provided by a generator and DC power (for sounder and GPS) by lead/acid batteries. The boat *RV Serpula* provided an ideal and stable survey platform with adequate deck space and cover for electronic equipment.

The emphasis of the survey was on AGDS for the first two days, although a small number of video drops was carried out to build up knowledge of the sea floor. The track data were plotted to show variation in acoustic values on the evening of the third day and the results used to help select locations for ground truth sampling. The main survey tracks were run in a northwest to southeast orientation, at 90° to the long axis of the Treshnish Isles. A track was also run around the island at high tide as close in to shore as possible to define the inner limit of the survey. Other tracks were collected as the vessel travelled between the selected ground truth locations. Overall, track spacing over the survey area varied from less than 100m close to the islands, to a maximum of 250m at the deeper outer limits of the survey area (Figure 3.2).

The central section of the Treshnish Isles between Fladda and Lunga is an archipelago of small islets, rocks and reefs exposed at low water. This area is very shallow and impossible to navigate in *RV Serpula*. An alternative survey method was adopted, based on the principle of interpreting the aerial photographs of these shallows using a simple drop-down CCTV system from a small inflatable boat to obtain ground truth data. The pictures were of poor quality, but of sufficient resolution to determine the seabed type and main species present. Field notes were made at the time but the images were not recorded.

Ground truth information on the nature of the seabed over the greater part of the survey area was obtained to interpret the AGDS data, using a more sophisticated drop-down/towed video system. The digital camera was controlled from the surface and sample footage of most of the tows was recorded digitally within the camera in its housing. Additionally, the video picture was relayed to a surface unit and the full drop was recorded in Hi8 format. The surface unit also had the facility to record DGPS position and depth of the sledge (the latter via a depth gauge in the camera housing itself) onto the Hi8 tape. In all, 100 video drops/short tows were taken of between 2-3 minutes duration each. Long tows traversing different ground types were avoided wherever possible to simplify the classification of the records. Notes were made on survey of the conspicuous habitat features seen on the surface monitor. The locations of the ground truth data are illustrated in Figure 3.3.

## Data analysis

The AGDS data were processed according to the JNCC Procedural Guidelines (Foster-Smith *et al.* 2001). Water depths were corrected to the nearest ten minutes using tidal data for Iona. Data were checked for positional and depth spikes, and any dubious data removed. Data collected when the vessel was drifting have also been removed.

The E1 and E2 data have been checked for consistency between survey days and are considered to be of a similar distribution; thus the values are shown below without the need for standardisation between each day's data sets. However, whilst the greater part of the seabed within the cSAC is shallower than 45m, its eastern boundary lies along the edge of a deep trough separating the Treshnish Isles from Mull, and the seabed slopes rapidly to water depths of between 60-100m. The lower depth limit of the RoxAnn system when set up for shallow water data is 60m, and the power of the sounder was manually increased during the survey to obtain records below this depth. These records have been included in the subsequent analysis of the data and presented in the final maps. In addition however, the drop-down camera system used was limited to a maximum water depth of 45m, so the interpretation of AGDS data below this depth must be viewed with further caution. This deep area may require further ground truth sampling if such a feature is considered important to the cSAC in the future.

In addition to E1, E2 and depth, a complementary set of variables was derived from each based on the standard deviation of five points before and after each track point. This equates to a measure of the variability of the ground approximately 35m (taking the average distance between RoxAnn track points in a data set as 7m) either side of each track point. The two reasons for using this measure are: 1) interpolation (see below) smoothes data and reduces along-track variability which may be important for characterising ground, and 2) gives some measure of topographic complexity.

## Interpolation

Interpolation transforms point data to a continuous surface by calculating new values for a grid of positions covering a rectangular area that encompasses the track point data. The reasons for interpolation are, firstly, to produce a coverage that is easier to view as a map than point data and, secondly, to enable raster-based image processing techniques to be applied to the data.

The edited track data were interpolated in *Surfer*<sup>TM</sup> using the following parameters:

- a grid spacing of 25m;
- inverse distance algorithm with a weighting toward the grid centroid of 1.5;
- a search and display radius of 500m (to ensure there were no gaps in the coverage);
- a four-sector search with a maximum of 32 values per sector;
- a smoothing coefficient of 50.

The grids were saved in ASCII file format for importing into *Idrisi*<sup>TM</sup> software, for the application of classification procedures.

Interpolation also smoothes data. AGDS track data are inherently variable, even over a seabed of uniform sediment type, with the data values for E1 and E2 scattered around a mean value. Interpolation can be used to create new values at the grid nodes that are a distance-weighted mean value of the real track data within a set search radius around the node. This results in a more stable surface of E1 and E2 values that is more amenable to analysis, compared to the raw data. The parameters selected and listed above were chosen to ensure that the interpolated values were dependent upon real data from at least two adjacent tracks and with a light weighting towards the data closest to the node.

## **Supervised classification**

The raster grid images were imported into *Idrisi™* for classification. Supervised classification using the maximum likelihood classifier is generally regarded as the most satisfactory means of interpreting multispectral data, and the different acoustic variables have been considered as analogous to electromagnetic data from satellite or airborne sensors.

The grid images derived from six acoustic variables were used for classification: E1, E2, positive depth corrected to chart datum, standard deviation of E1, E2 and the raw depths. The values of the raster pixels were then stretched to lie between 0-255 for image processing (integer values). The track data for each of the three primary and the three derived variables used in the classification process are shown in Figure 3.4. In most cases there is continuity in the patterns between adjacent tracks and this adds confidence to data quality. Note that, since the values of the variables are normalised between 0-255 for image processing, the actual values are not shown and the colours are indicative only.

The video data were categorised to biotope level or, if this fine level of detail was not possible, to a higher habitat complex level. A buffer zone of 50m was created around each of the video sample locations which was then used as a 'training' site to create the acoustic signatures from the six acoustic variables used (as above). The signatures were then applied using the maximum likelihood classifier.

The process was repeated for the habitat classes without the need to constrain or enhance any individual class. The agreement between classification and the video ground truth data can be visually assessed from the resultant maps presented in the results section (Section 4). A measure of the agreement can be calculated by overlaying the ground truth and classified images and matching predicted to actual on a pixel-by-pixel basis (the 'error matrix'). The overall Kappa agreement (probability of agreement above chance) for the life form maps and the sediment maps was 0.61 and 0.59 respectively. This level of agreement is typical of remote surveys where perfect agreement (1.0) is never expected due to a combination of positional error and variability in the acoustic reflectance data. Typically, a probability of 0.40 would be poor, whilst 0.70 would be very good indeed. Overall, the classification can be considered successful, particularly in demonstrating broad spatial patterns in habitat and biotope distribution, though this will be explored further in the discussion section.

## **Analysis of the video data**

Video data were recorded using an *Access™* database, the structure of which is outlined in Figure 3.5.

The video tapes were replayed and at least one frame grab was captured for each sample. The frame grabs were stored in a sub-table linked to the master table. Notes were taken in a systematic way recording main habitat features, conspicuous species or, where this detail was not possible, general growth forms and higher taxonomic categories. The biota were also scored from 1-5 to show their relative abundance. The species were recorded in a sub-table linked to the master table so that site/species tables could easily be extracted (see Figure 3.5). The notes were first made on paper and then the tapes were replayed and the notes entered into a database, but with entries for biotope codes and habitat categories left blank. The final stage consisted of reviewing the database, frame grabs and if necessary the tapes, in order to tag the records with biotope codes and habitat classes. The video data were categorised to biotope level (Connor *et al.* 1997b) or, if this fine level of detail was not possible, to a higher habitat complex level. The records were also categorised to a more generic life form system, based on the general structure or appearance of the conspicuous species (Foster-Smith *et al.* 2000) and these were used for image processing as more appropriate units. Records were also categorised into sediment classes. This staged process to biotope recording and the use of

look-up tables for codes and terminology was designed to promote consistency in the classification of the records.

#### *Interpretation of aerial photography*

The single photomosaic image of the islands was taken into ArcGIS for geo-registration. However, distortions within the photomosaic became apparent and the image was therefore split into sections in order to obtain a best fit to the OS Landline data. It is estimated that the distortion may have resulted in boundaries drawn from the geo-registered images being as much as  $\pm 25\text{m}$  from their true position. However, this is within the level of accuracy of the rest of the survey and the overall resolution of the combined subtidal map.

The geo-rectified images are accessible through the ArcView GIS project provided with this report, and are also shown in Figure 3.6.

### 3.3 Intertidal

#### *Fieldwork*

The methods employed during the intertidal biotope mapping survey broadly followed those outlined by Wyn *et al.* (2000). Fieldwork took place during spring tides over the seven-day period 11-17 August 2003, following directly on from the subtidal survey. Dr Iain Dixon, Ben James, Jonathan Hunt, Peter Campbell and Adele Cromie carried out the intertidal survey, working as two teams. The weather was mostly fine, and although travel to and from the islands was uncomfortably rough over 2 days, no weather downtime was incurred.

Ordnance Survey (OS) Landline data for the Treshnish Isles were provided by SNH, and were combined with the aerial photography to provide a series of laminated colour photographs for use in the field at a scale of 1:5,000. In addition, forms for recording biotope details, waypoints, target notes and photography were printed onto waterproof paper. As for the subtidal survey, access to the islands was by the *RV Serpula* operating out of Bunessan, in addition to which a 4m inflatable boat was used for ferrying teams ashore.

For most of the islands, the shoreline was walked and directly observed by the survey teams. However, where progress along the shore was impractical or not possible, the shore was observed and mapped from the top of the backing cliffs (the island of Fladda was mostly mapped in this way).

The observed biotope distribution was drawn directly onto the aerial photographs as a series of adjoining polygons. Having the aerial photographic data eased the mapping process considerably, since the biotope boundaries visible on the shore were often evident on the photograph. The photographs also aided navigation and position fixing, though relating GPS data to the maps was facilitated by having a 50m by 50m grid labelled with eastings and northings superimposed on all the maps. Handheld GPS was used to record the position of biotope boundaries, target notes and photographs in the form of stored waypoints. As far as possible each area (or polygon) mapped corresponded to a single biotope. Biotopes too small to be mapped (polygons smaller than approximately 5m by 5m) were either recorded as subsidiary biotopes within a larger polygon, or were recorded as a target note at a point location.

Photography was integral to the recording process, and digital photographs were taken to illustrate the site in general, the biotopes present and close ups of many of the marine organisms present.

Whilst the two field teams generally worked separately, a period of time was spent together on the shore on the first day to harmonise working practices and to agree on the identity of the more widespread shore biotopes (based on Connor *et al.* 1997a).

Upon completion of each day's fieldwork field notes were typed, and the information on the field maps detailing polygon boundaries and target notes was transferred onto a neat map. Biotope codes were also assigned to the data or finalised at this stage. As the survey progressed, a master list of numbered biotopes was maintained, and used to harmonise the labelling of polygons on the neat maps by the two teams. Digital photographs were downloaded onto a laptop computer at the end of each day, together with GPS waypoints and tracks.

Low water times centred around midday during the survey. Whilst the ideal was to limit surveying to a period of two hours either side of low water, in practice work often extended to three hours after low water. With transit time to and from the islands, the fieldwork each day typically amounted to 12h or more. This meant that writing-up each day tended to lag behind. However, the physical mapping was completed on 16 August, allowing the final day to be set aside for an essential period of completing records and data logging. Overall, the seven days budgeted was sufficient for the intertidal mapping.

### Data analysis

The neat maps were again checked with reference to field notes, photographs and plotted waypoints, and minor adjustments made to polygon boundaries if necessary. The neat maps were then scanned, imported into a GIS and the hand-drawn polygons then digitised. The final data record consisted of a site sheet including the following information:

Surveyors	The identity of the survey staff responsible for each record.
Date	The date on which each survey record was made.
Map/photo number	The map or aerial photograph section upon which each record or polygon was located.
Polygon number	The unique number given to each mapped area or polygon.
Waypoint number	The identifier for each waypoint logged.
Photo number	The identifier for each photograph taken in or of a polygon.
Target number	A record of any target note associated with a given polygon.
Habitat	Description of the habitat present within each polygon.
Habitat code	Habitat code from the biotope manual.
Main biotope	Biotope code applicable to each polygon.
Main species in the biotope	The main species dominating or characterising the main biotope in the polygon.
Subsidiary biotopes	Description of the habitat and main species present for any subsidiary biotopes within a given polygon.
Species in subsidiary biotope	The main species dominating or characterising the subsidiary biotope(s) in the polygon.
Notes	Other supporting information on the biotope, polygon or its location.

For the final map representation, biotopes were coloured according to the MNCR scheme in Connor *et al.* (1997a, b) and also to the Life Forms format (Foster-Smith *et al.* 2000) for comparison. Note that the current MNCR colour scheme (based on the exposure grade as indicated by the higher code prefix to the biotope code) does not cater for lichen or algal crust biotopes. Such biotopes come under the higher code Littoral Rock, which does not incorporate an exposure label. Therefore in the maps coloured according to the MNCR scheme, the Life Form colours have been applied to these biotopes, with the exception of where there are two or more biotopes from the same habitat group. These have had to be distinguished by slight alterations to hue, since hatching patterns visible on the screen in the Arc GIS projects are lost when saved as high-quality images.

Figure 3.1 – Approximate flight pattern for aerial photography, Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))

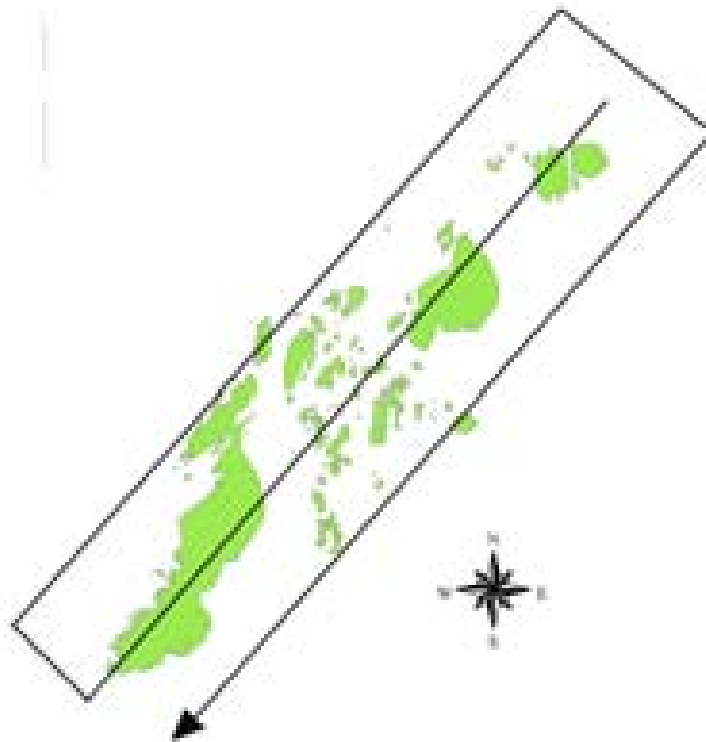


Figure 3.2 - Acoustic tracking completed, Treshnish Isles biotope mapping survey, August 2003(© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))

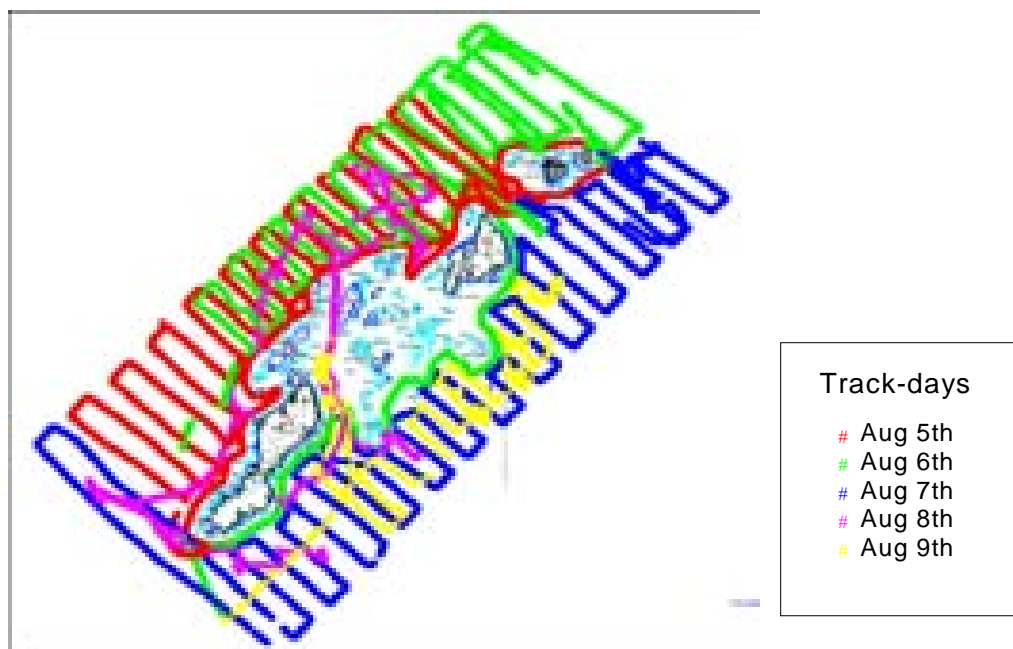


Figure 3.3 - Ground truth video locations, Treshnish Isles  
biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish  
Natural Heritage. 100017908 (2009))

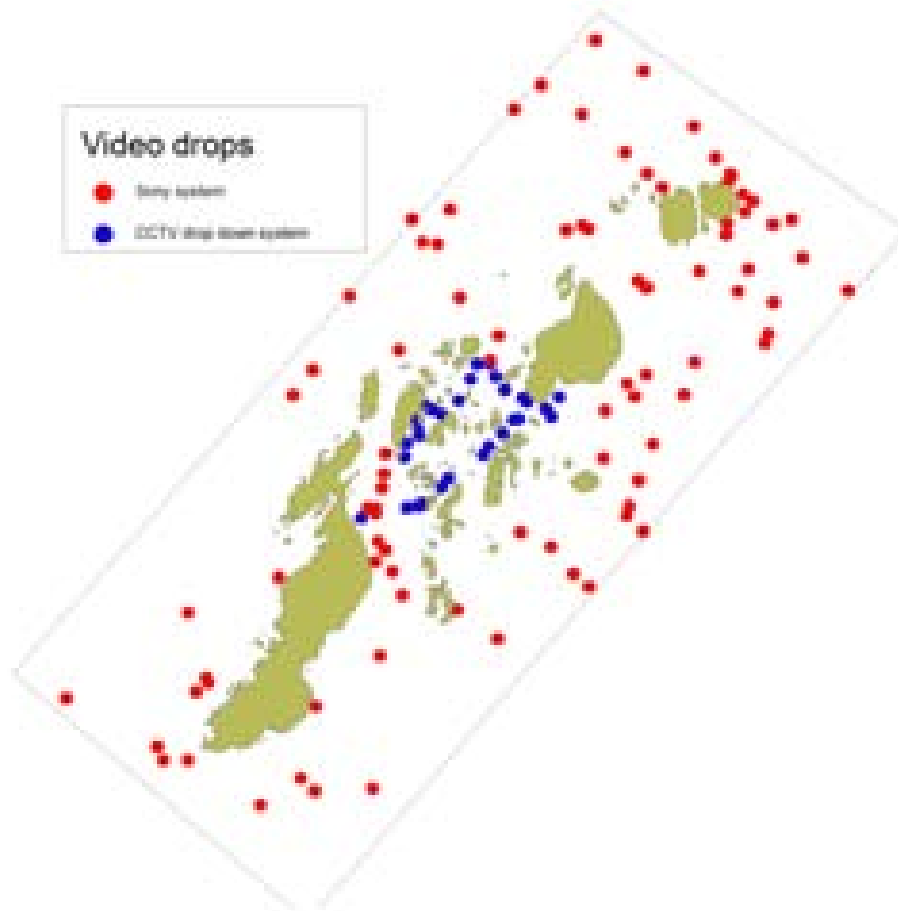
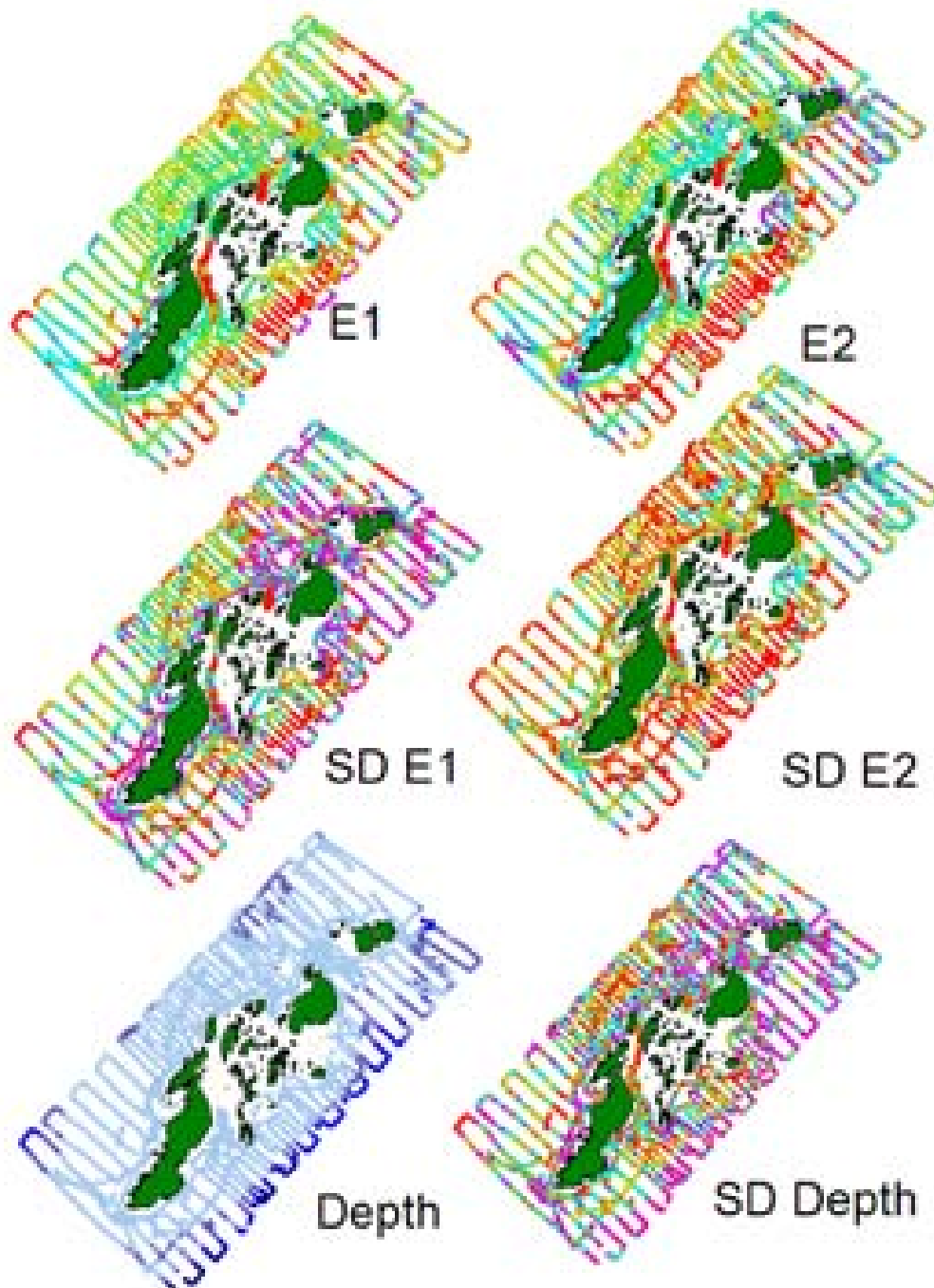




Figure 3.4 – Track data coloured to show increments in values of the three primary variables (E1, E2 and depth) plus the three derived acoustic variables used in the classification process (standard deviation of E1, E2 and depth), Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))



Note that the actual values are not shown and that the colours are indicative only; greys and blues low and reds and purples high.

Figure 3.5 - The structure of the database showing the relationships between the look-up tables and sub tables to the master table, Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))

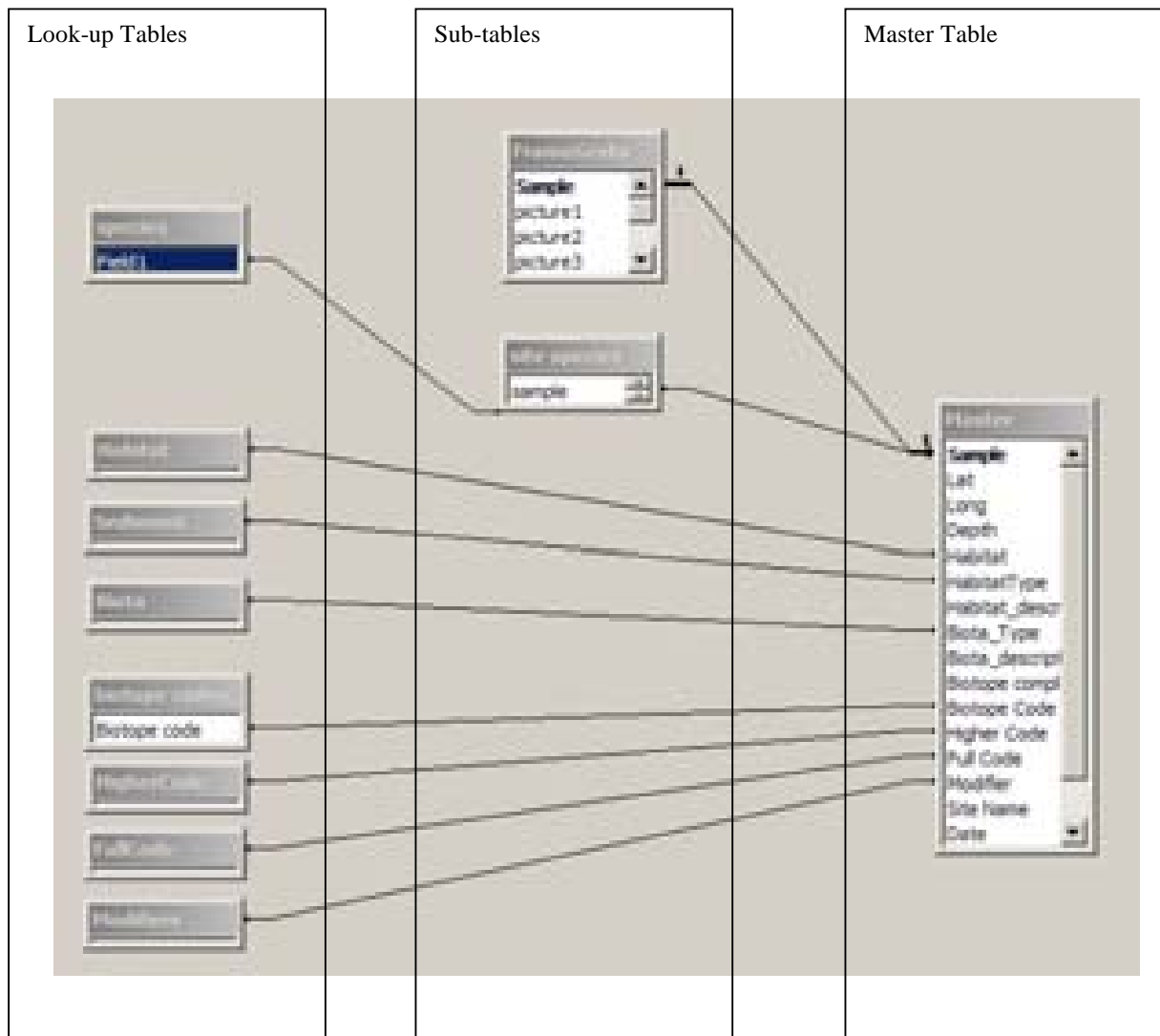
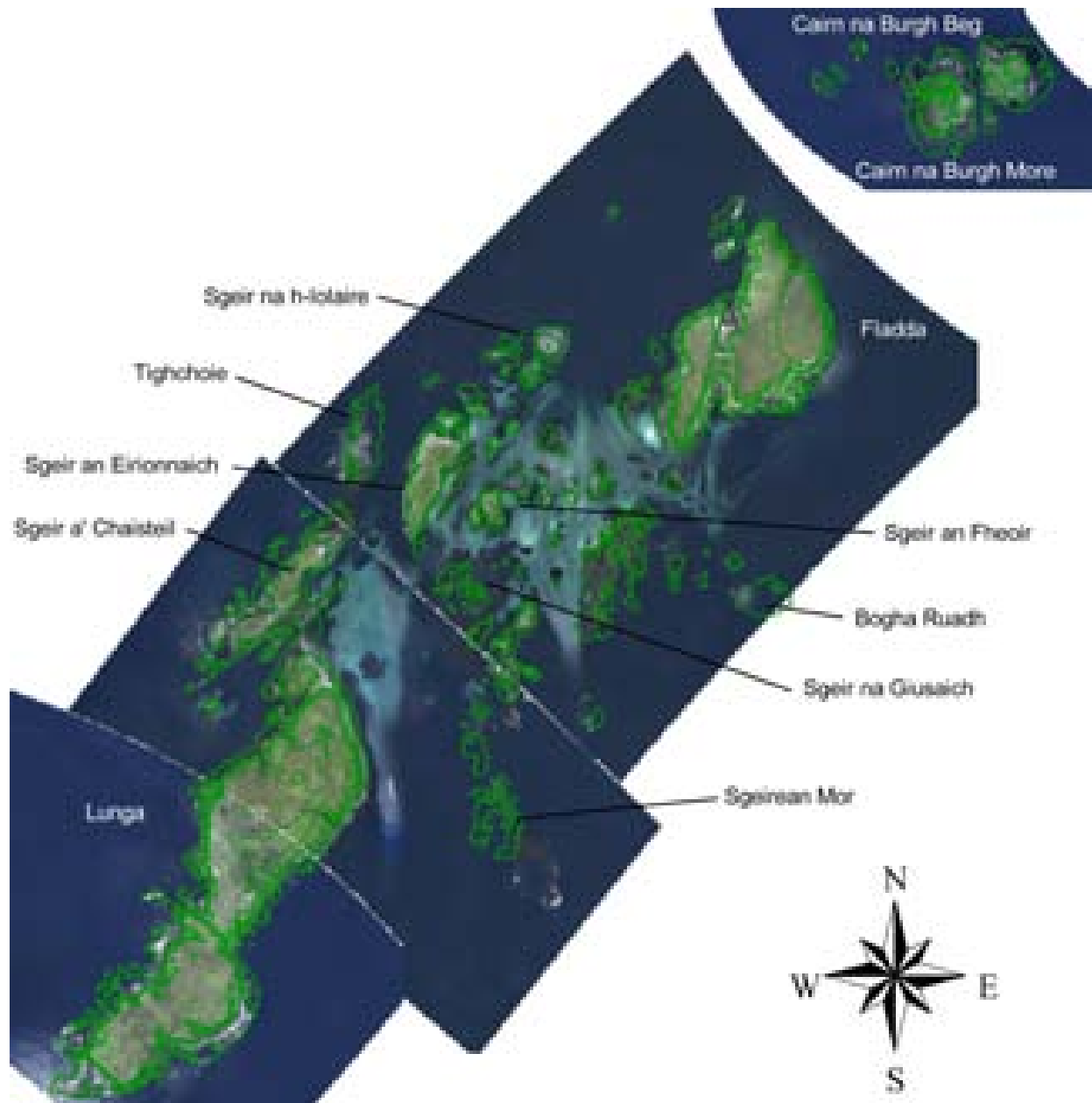


Figure 3.6 – Geo-rectified aerial photography overlain with Ordnance Survey Landline data, Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))



## 4 RESULTS

Original field notes, maps and logs completed during the survey, together with electronic data files, video tape and photographs, have been supplied to SNH. In addition, the maps and data presented below have been supplied electronically as image and document files, as well as in Access database and ArcView GIS formats. A guide to the subtidal and aerial photographic data supplied electronically is given in Appendix 1 to this report. In addition, the photographic, waypoint, target note and biotope logs resulting from the intertidal work are presented in Appendices 2-5.

### Subtidal

#### *Bathymetry*

The bathymetry of the survey area derived from the acoustic record is illustrated in Figure 4.1. The seabed falls away rapidly from the shoreline, isobaths forming a closely spaced series of concentric rings around the island group to a depth of 25-30m below chart datum. Amongst the islands, however, there is an extensive shallows lying between Lunga and Fladda, bounded by Sgeir na h-Iolaire to the north, Bogha Ruadh to the east and Sgeirean Mor to the south. Here, the seafloor lies between 0 and 10m depth and is punctuated by numerous islets, rocks and barely submerged reefs. A channel runs south to north through the islands between the northeast coast of Lunga and the central area of shallows, reefs and rocks. Towards the southeastern border of the cSAC, within 1km of the Treshnish archipelago, the seafloor begins to slope away very steeply into a trough that separates the islands from Mull. At the cSAC boundary, water depths reach 100m below chart datum, though extend beyond this to charted depths of approximately 120m.

The three-dimensional nature of the seafloor is illustrated further in the terrain model of the Treshnish Isles cSAC derived from the depth data (Figure 4.2).

#### *Seabed type*

The nature of the seafloor as identified from individual video records is shown in Figure 4.3, whilst the predicted distribution of seabed types following the classification procedure is illustrated in Figure 4.4. It can be seen that the Treshnish Isles form a prominent rocky archipelago that rises quite steeply from a level plain of cobble, gravel and sand lying at 25 to 35m below chart datum. The bedrock and boulder habitat close inshore is particularly rugged around Cairn na Burgh and to the south of Lunga. The rock around the numerous islets between Fladda and Lunga was not observed in detail, partly because of the difficulties in navigation and partly because of the dense overgrowth of kelp. They have been labelled as bedrock, boulder, cobble and sand reflecting the patchy nature of the seafloor, but there is clearly a number of bedrock outcrops in this area that are exposed at low water.

The sediment patches between the islets range in nature from medium fine sands to extensive maerl gravel. The maerl gravel extends into the slightly deeper water of the channel running through the islands along the northeast coast of Lunga.

Due to the depth limitations on ground truth sampling by video, the actual nature of the deep seabed along the southern half of the eastern boundary of the cSAC is unknown. However, on the basis of data from the rest of the cSAC and the supervised classification of the AGDS data, it is predicted to vary from shelly sand at the southernmost corner, grading to boulders or bedrock/boulders halfway up the eastern side.

### Subtidal biotope data

A total of 19 biotopes or higher habitat categories were identified from the video records and these were arranged into 12 life form types based on overall growth form and species composition. A summary of these records is presented in Table 4.1, which also shows the concordance between biotopes (or higher level classification) and the life forms. A full list of all records is included in Table A4 of Appendix 1 to this report. These more general life form categories were considered more suitable for image processing and classification. The distribution of life forms from the video records is shown in Figure 4.5 and the predicted distribution of these life forms following classification is mapped for the survey area in Figure 4.6. Equivalent maps have been prepared to show the biotope recorded at each video location (Figure 4.7) and the mapped biotope distribution (Figure 4.8) based on the predominant habitat type for the biotopes concerned.

The range of biotopes and species contained within them is limited. The rock surfaces at most depths were generally heavily encrusted with the encrusting tubeworm *Pomatoceros triqueter* and barnacle *Balanus* sp., and in addition supported either the kelp species *Laminaria hyperborea* and other seaweeds in the shallower rocky areas around the islands or hydroid/bryozoan turfs in the deeper regions.

In general, the kelp forests consisting primarily of *Laminaria hyperborea* occurred shallowest or closest to the islands, within the overall depth range 5-18m (MIR.Lhyp.Ft and EIR.LhypR.Ft). Over a wider area around the islands and within a similar depth range, the *L. hyperborea* forest was typically mixed with another kelp species *L. saccharina*, and included other brown algae such as *Desmarestia aculeata* and *Dictyota dichotoma* in addition to various unidentified red algae (SIR.LhypLsac.Ft, SIR.Lsac.Ft and SIR.Lsac). Areas of less dense kelp, known as kelp park, occurred in still deeper water slightly further offshore to a maximum depth of approximately 23m (MIR.Lhyp.Pk and EIR.LhypR.Pk).

The other main biotopes to occur within the algal-dominated shallows amongst the islands were beds of maerl (IGS.Phy) and seagrass (IMS.Zmar). Maerl beds were extensive in the channels amongst the reefs and shallows between Lunga and Fladda, and also occurred in the slightly deeper main channel running south to north through the Treshnish Isles along the northeast coast of Lunga. Some of the maerl beds were densely overgrown with algae and sparse *L. saccharina*. A dense bed of the seagrass *Zostera marina* was found close to this main channel, beneath the area used as an anchorage by boats visiting Lunga.

Further offshore, beyond the algal-dominated rocky sublittoral habitats, deeper bedrock and boulder habitats generally supported faunal crust and faunal turf life forms, or biotopes characterised by *Pomatoceros triqueter* and barnacles (ECR.PomByC) or turfs of bryozoans, hydroids and the soft coral *Alcyonium digitatum* (ECR.AlcSec, MCR.Flu.Flu, MCR.ByH and MCR.SNemAdia). However, sedimentary habitats dominated the seabed types within the cSAC overall, and it is likely that the hard substrata present in the circalittoral are patchy in occurrence and influenced to some extent by scour from nearby sediment and/or mobility.

Brittlestars were found at low to moderate densities on many of the circalittoral biotopes, but never in such densities to justify their classification as brittlestar beds.

Offshore circalittoral sediments were either of barren gravel or silty gravelly sands. An unidentified anthozoan was commonly observed at some of these sites (thought to be *Caryophyllia smithii* growing on gravel and shell fragments), together with sparse *Cerianthus lloydii*, the polychaete *Lanice conchilega* and the decapod *Munida rugosa*. The deep seabed along the main southeast boundary of the cSAC is predicted to consist predominantly of barren sand or circalittoral gravel and sand, with patches of cobbles and boulders supporting a scoured encrusting biota characterised by tubeworms and barnacles.

Overall, it is apparent that many of the species identified subtidally around the Treshnish Islands occur across a number of habitats. This is evident in Table 4.1, but is also highlighted in Table 4.2 in which biotopes or life form categories are cross-tabulated with seabed type. For example, communities characterised either by kelp, or by sparse conspicuous fauna, were found on several of the seabed types identified.

## **Intertidal**

### *Intertidal habitats*

The shores of the Treshnish Isles are predominantly open, rocky and steep, and the larger islands tend to be exposed from the south and west, and moderately exposed from the east and north. Shores are generally narrow, steep and backed by cliffs, although more extensive intertidal rocky areas occasionally occur on the more exposed coasts. Examples of these occur around the southern end of Lunga and on the south end of Sgeir a' Chaisteil. Most shores consist of bedrock but on less exposed eastern coasts in particular, the upper shore is additionally overlain with large stable boulders and the lower shore with medium or small boulders. In addition, patches or banks of cobbles occur in the upper shore and supralittoral where gullies have been cut back into the cliffs.

Pockets of shelter are restricted to two inlets on Fladda, one of which includes limited intertidal sediment, and to inter-island channels such as that between Cairn na Burgh More and Cairn na Burgh Beg, and between Lunga and Sgeir a' Chaisteil. There are two sizeable inlets on the island of Fladda; the south-facing one contains a mixture of hard substrata in which cobbles and small boulders predominate, and has a small freshwater stream at its head. The north-facing inlet on Fladda is wider and flatter, flanked by sheltered boulders, but otherwise consists of coarse sand with shell gravel and pebbles.

The other feature characterising the Treshnish Islands is the number of small islets, reefs and rocks clustered within the shallows between Lunga and Fladda. Generally these are less exposed than the larger islands. Some are high enough to support lichen biotopes or even patches of grass, but most are low lying and within the lower eulittoral or sublittoral fringe.

### **4.1.1 Intertidal biotope data**

A total of 33 main and subsidiary intertidal biotopes were recognised during the survey, and these are listed and described in Table 4.3 (ordered as in Connor *et al.* 1997a). The distribution of the main biotopes found around the Treshnish Isles is mapped in Figures 4.9-4.17, in which the colours are based on the MNCR colour scheme. Note that the difficulties inherent in representing cliff or vertical face habitats on a map have been met where appropriate by indicating the location and extent of any cliffs on the map, and linking this to a sketched profile indicating the succession of biotopes present on the cliff.

Of the biotopes found, the most ubiquitous were LR.YG, and MLR.PeIB in supralittoral and upper shore habitats, and MIR.Ldig and EIR.Ala.Ldig in the sublittoral fringe. The mid shore zones tended to be occupied by one or more of ELR.BPat.Fvesl, ELR.BPat.Sem and MLR.FvesB.

#### 4.1.2 Intertidal biotope distribution and zonation

Overall, the shores were characterised by barnacle and fucoid-dominated biotopes which occupied most of the mid-shore zones. The shores of the north and west coasts consisted of exposed bedrock terraces and were often found to support areas of the wave-exposed *linearis* form of *Fucus vesiculosus* in addition to barnacles and mussels (ELR.BPat.Fvesl). Mid shore or lower mid shore horizontal bedrock in more sheltered situations supported more of the normal vesiculate form of *F. vesiculosus* and fewer barnacles, and was therefore usually classified as MLR.FvesB. Vertical bedrock or large boulders in the mid eulittoral typically reverted to ELR.BPat.Sem, and only rarely to ELR.MytB since vertical rock with the necessary exposure was only observed once or twice on south or west coasts in the Treshnish Isles cSAC. The alga *Lichina* sp. was often present on steeply sloping mid eulittoral rock with barnacles and limpets, and this led to several records of ELR.BPat.Lic.

In the sublittoral fringe all around the island's open coast there was *Alaria esculenta* mixed with *Laminaria digitata* and encrusting coralline algae (EIR.Ala.Ldig). Within the relative shelter offered along eastern shores overall, and within inlets or sheltered sounds between islets, the open coast biotope tended to be replaced by one with increased algal cover in which *L. digitata* became dominant (MIR.Ldig). The lower exposure levels in these areas permitted more luxurious algal growth on a wider variety of substrata, and *Fucus serratus* biotopes and *Ascophyllum nodosum*-dominated biotopes were found in the inlets on Fladda for example. In the southern inlet on Fladda, a biotope characterised by *Fucus ceranoides* (SLR.FcerX) was identified where the shore came under the influence of a fresh water stream. The larger northern inlet supported extensive areas of SLR.AscX, and was also unusual in harbouring sediment flats supporting an infauna that included *Arenicola marina* and *Lanice conchilega* (LGS.AP.P). Apart from a small patch of coarse sand on the west coast of Fladda, this was the only intertidal fine sediment biotope recorded in the cSAC.

Upper shore and littoral fringe biotopes were represented chiefly by LR.YG and MLR.PeIB. Along most shores, the open coast black and yellow lichen bands tended to occur in clear and separate zones, and one or both usually extended up cliff faces that typically backed most shores. Where the black lichen zone occurred on a vertical face, it was assigned to LR.Ver or occasionally to LR.Ver.B. More usually however, the black lichen zone contained horizontal bedrock or large boulders with flat tops. This feature permitted the establishment of the channelled wrack *Pelvetia canaliculata*, and hence the designation of the biotope as MLR.PeIB. The green alga *Prasiola stipitata*, characteristic of shores frequented by large numbers of roosting or breeding seabird populations, was found in the splash zone at just one location on the northern end of Sgeir a' Chaisteil.

Several areas of cobbles or small boulders were observed on Lunga. Those on the spit at the north end of the island appeared bare from a distance, but variously supported SLR.EphX, LGS.BarSh and MLR.PeIB. Elsewhere on Lunga, and at one or two locations on some of the other larger islands, the cliffs were deeply incised by gullies. These were usually floored with barren boulders and cobbles (LGS.BarSh) but occasionally had small associated midshore areas covered with *Enteromorpha* sp. (MLR.Ent). Unstable boulder habitats within gullies were additionally recorded at two or three locations on Lunga and Sgeir a' Chaisteil. These differed from MLR.Ent in that the boulders also supported sparse fucoids, barnacles and limpets and abundant *Littorina littorea*, and were thus designated SLR.BLit.

Many rock pools occurred in the Treshnish Isles intertidal and were recorded as sub-biotopes, most often within the upper shore yellow and grey or black lichen biotopes. These small upper shore pools tended to be dominated by *Enteromorpha* sp. (LR.G) or by encrusting coralline algae with *Patella* spp. and spirorbid polychaetes (LR.Cor). Occasionally, the green pools were large enough to be mapped. Mid and lower shore

habitats occasionally featured pools with fucoids and kelps (LR.FK) and on some of the more extensive midshore plateaux, these were also large enough to be mapped as standalone biotopes.

The islets, reefs and rocks clustered within the shallows between Lunga and Fladda were generally less exposed than the larger islands. Some were high enough to support lichen biotopes (LR.YG and LR.Ver) or even patches of grass. Most were steep-sided and supported a white band of ELR.BPat.Sem between the kelp zone and the black lichens. Sgeir an Fheoir and some of the rocks between here and Sgeir an Eirionnaich had mid-eulittoral zones extensive enough to support areas of *Ascophyllum nodosum*. However, most of the rocks were low lying and within the lower eulittoral or sublittoral fringe, and therefore supported EIR.Ala.Ldig and/or MIR.Ldig. One particularly extensive reef top in the sublittoral fringe, just to the west of Bogha Ruadh, was covered in a mixture of *Laminaria digitata* and *Himanthalia elongata*, and thus designated mostly as ELR.Him.



Table 4.1 - Subtidal biotope listing with summary habitat and species information, Treshnish Isles biotope mapping survey, August 2003

Life form (used for interpretation)	Depth range	Biotope code	Number of records	Biotope complex	Characteristic species
Algal and faunal turf	19- 30	MCR.Flu.HByS	1	Bryozoan/hydroid turfs	A wide range of bryozoans and hydroids (particularly <i>Nemertesia</i> sp.) together with foliose red seaweeds and often <i>Dictyota dichotoma</i> .
		EIR.FoR	2	Kelp with fauna, foliose reds and coralline crusts	
		EIR.FoR.Dic	2		
		MCR.SNemAdiō a**	2	Bryozoan/hydroid turfs (sand influenced)	
Barren gravel	15-35	CGS*	6	Circolittoral gravel and sand	Clean gravel with no conspicuous fauna; often with large numbers of shells.
Barren sand	8-45	CGS*	6	Circolittoral gravel and sand	Clean sand with no conspicuous fauna; often with large numbers of shells.
		IGS	3	Infralittoral gravel and sand	
Bryozoan/hydroid turf	15-35	ECR.AlcSec	2	<i>Alcyonium</i> -dominated communities	Typically with <i>Nemertesia antennina</i> and <i>N. ramosa</i> with bryozoans <i>Securiflustra securifrons</i> and <i>Bugula</i> sp. Sometimes with dense <i>Alcyonium digitatum</i> .
		MCR.ByH	1	Bryozoan/hydroid turfs	
		MCR.Flu.Flu	1		
		MCR.SNemAdia**	4		
Faunal crusts and turf	23- 45	ECR.PomByC	14	Faunal crusts or short turfs (wave exposed rock)	Encrusting <i>Pomatoceros triqueter</i> and <i>Balanus</i> sp. Often with a very short turf of hydroids and sparse taller bryozoans.
Kelp forest and algal turf	5-18	MIR.Lhyp.Ft	1	Kelp with red seaweeds (moderately exposed rock)	<i>Laminaria hyperborea</i> with dense foliose red algae on stipes. Encrusting <i>Pomatoceros triqueter</i> and <i>Balanus</i> sp. usually on rock with sparse-dense foliose red seaweeds.
		EIR.LhypR.Ft	9	Kelp with fauna, foliose reds and coralline crusts	
Kelp forest (mixed) and ephemeral seaweeds	8-16	SIR.LhypLsac.Ft	12	Silted kelp (stable rock)	Mixed <i>Laminaria hyperborea</i> and <i>L. saccharina</i> with <i>Desmarestia aculeata</i> , <i>Dictyota dichotoma</i> and foliose red seaweeds.
		SIR.Lsac.Ft	2		
		SIR.Lsac	1	Sand affected, disturbed kelp and seaweeds	
Kelp park	10-23	MIR.Lhyp.Pk	1	Kelp with red seaweeds (moderately exposed rock)	<i>Laminaria hyperborea</i> park with red seaweeds and faunal turf, usually with encrusting <i>Pomatoceros triqueter</i> and <i>Balanus</i> sp. on rock.
		EIR.LhypR.Pk	3		
Maerl	4-15	IGS.Phy*	13	Maerl beds (open coast/clean sediment)	Maerl gravel with sparse algal cover.
Maerl and algae	4-10	IGS.Phy*	3	Maerl beds (open coast/clean sediment)	Maerl gravel with dense foliose red algae and <i>Desmarestia aculeata</i> .
Seagrass	7-8	IMS.Zmar	4	Seagrass beds (sublittoral/lower shore)	Dense <i>Zostera marina</i> .
Sparse conspicuous fauna	20-40	CGS*	14	Circolittoral gravel and sand	Sparse <i>Lanice conchilega</i> and <i>Cerianthus lloydii</i> .

\* biotope or higher level category split between life forms

\*\* uncertainty as to identity has lead to split classes

Table 4.2 - Spread of life forms over the range of seabed types (number of records)  
Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))

Life form category	Habitat								
	Bedrock and boulder	Bedrock, boulders, cobble and sand	Boulders, cobble and sand	Cobble, gravel and sand	Gravel and sand	Maerl	Sand waves and boulders	Sand, medium fine	Sand, shelly
Algal and faunal turf	3		2	2					
Barren gravel					6				
Barren sand								1	8
Bryozoan/hyroid turf	3	1	4						
Faunal crusts and turf	1	3	7	4					
Kelp forest and algal turf	10								
Kelp forest (mixed) and ephemeral seaweeds	2	10	3		1				
Kelp park	3	1							
Maerl						16			
Seagrass								4	
Sparse conspicuous fauna				1	4		1	1	7

Figure 4.1 - Bathymetry (corrected) within the survey area, Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))

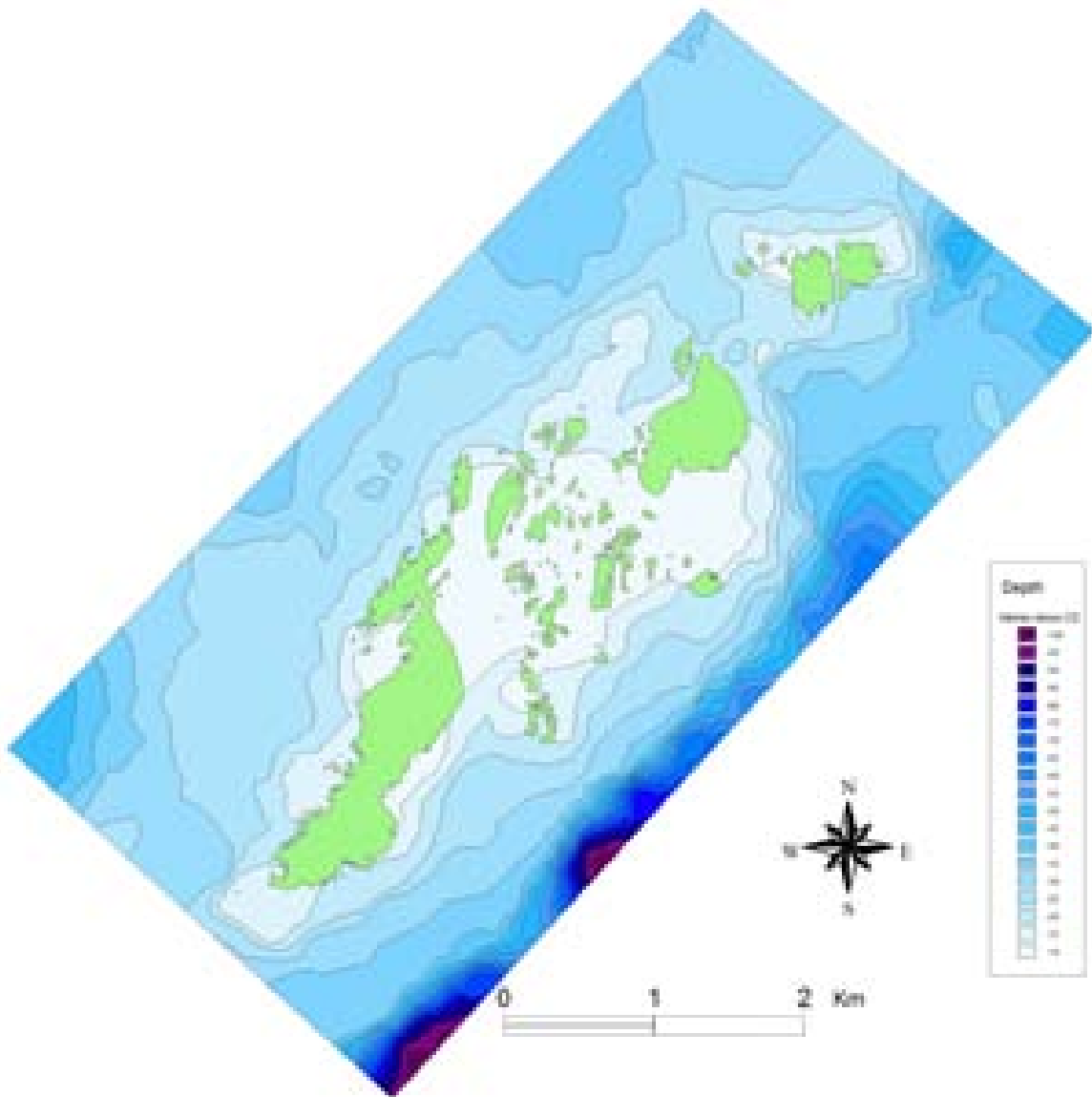
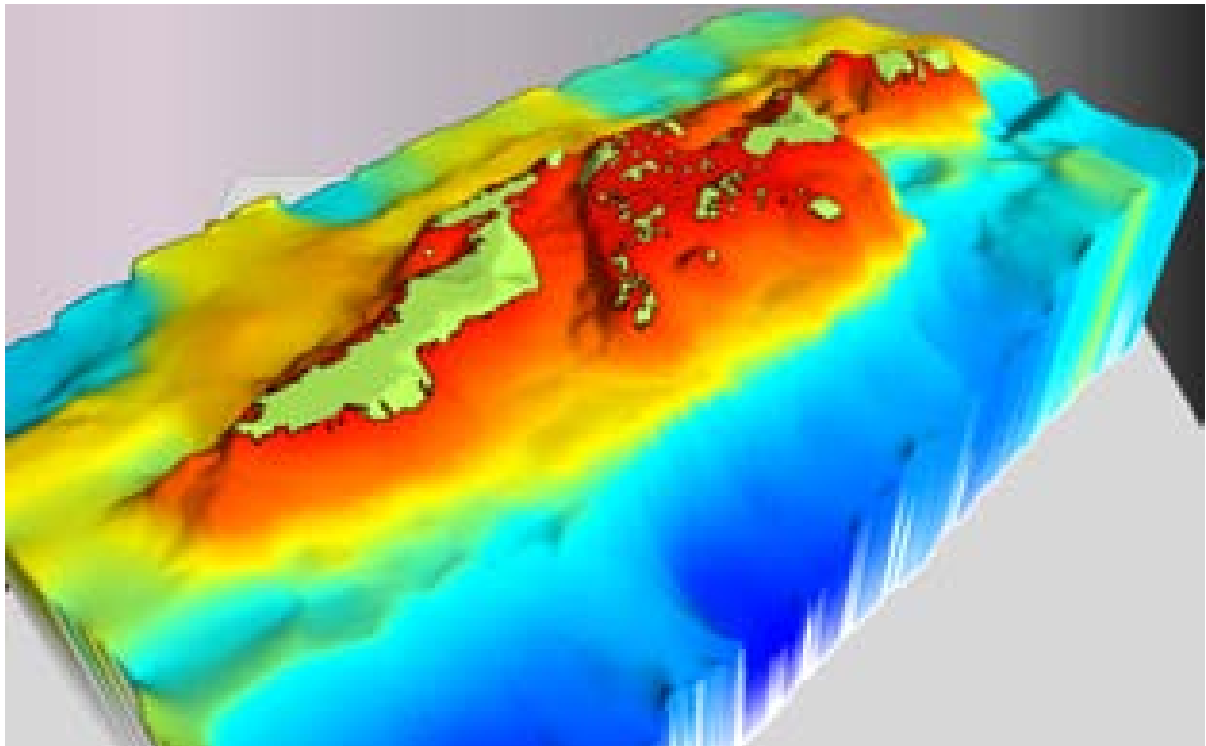


Figure 4.2 – Terrain model of the Treshnish Isles, Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))



Three-dimensional model based on bathymetric data from the AGDS survey, with water depth represented by colours ranging from dark blue (deepest) to dark red (shallowest). The Ordnance Survey landline data for the survey area, based on a mean low water coastline, is superimposed in pale green. Land relief is not shown.

Figure 4.3 - Seabed types identified at each drop-down video station, Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))

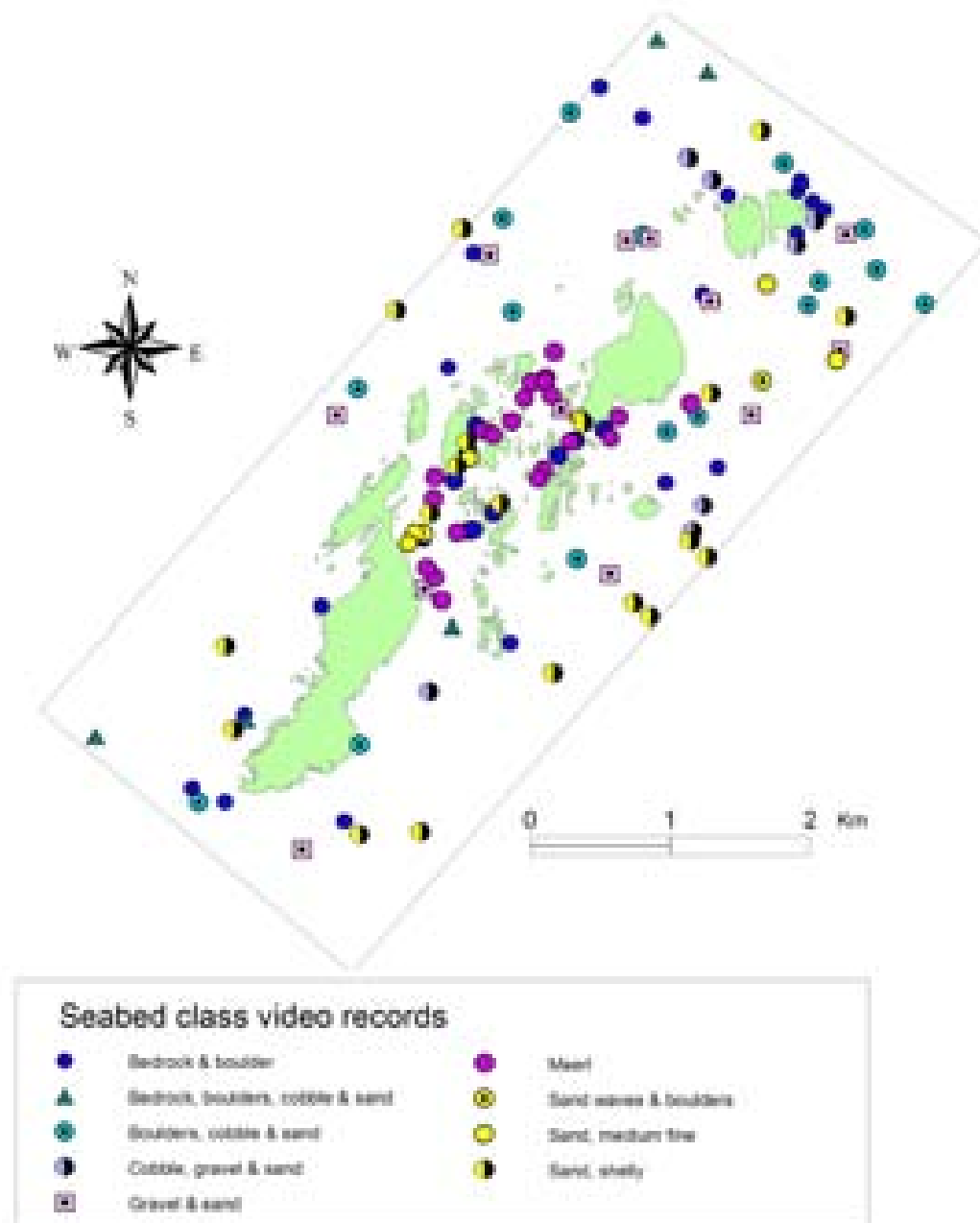


Figure 4.4 - Distribution of seabed types within the survey area, Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))

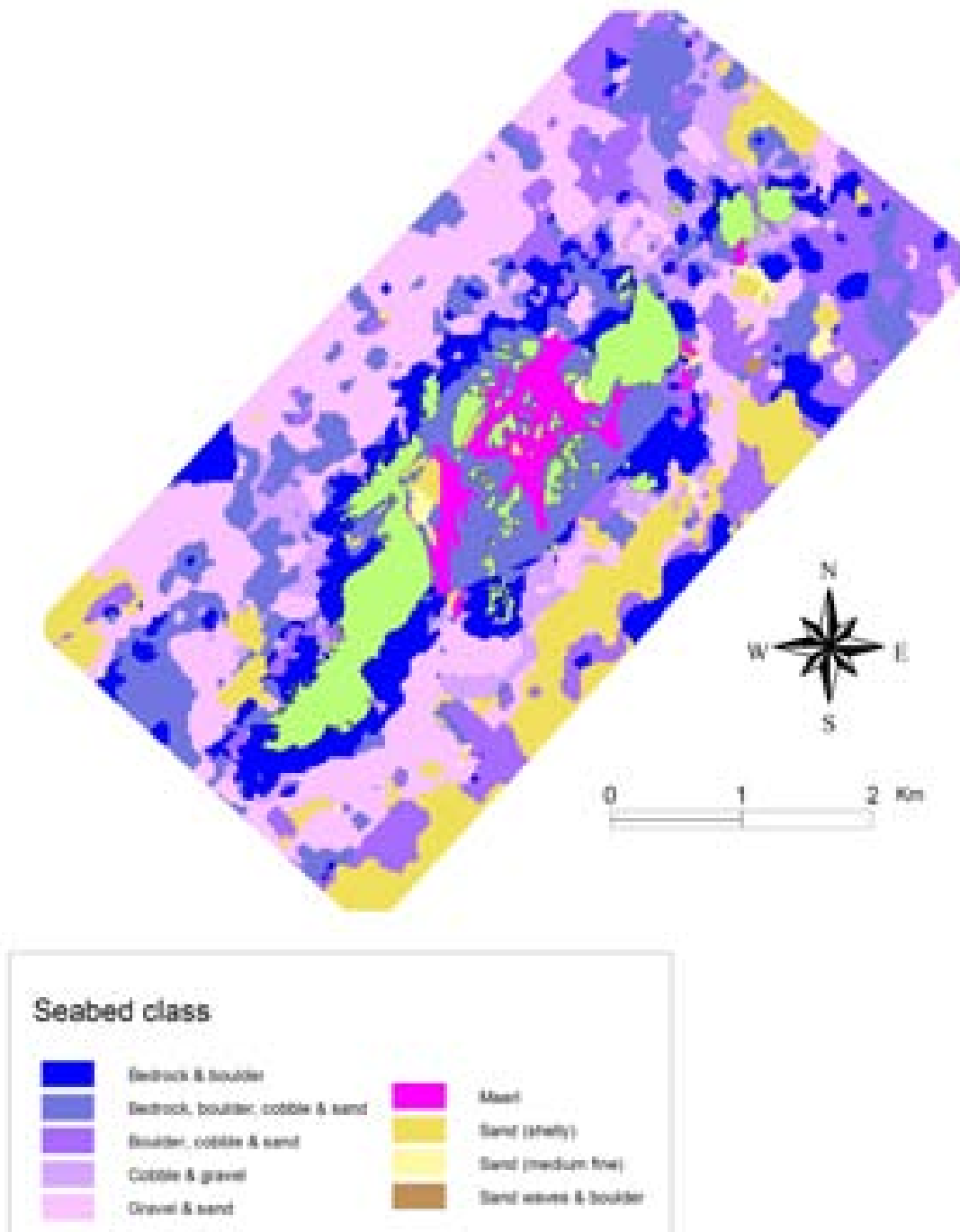


Figure 4.5 – Biological data observed at each drop-down video station, named and coloured according to Life Form scheme (Foster-Smith et al. 2000), Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))

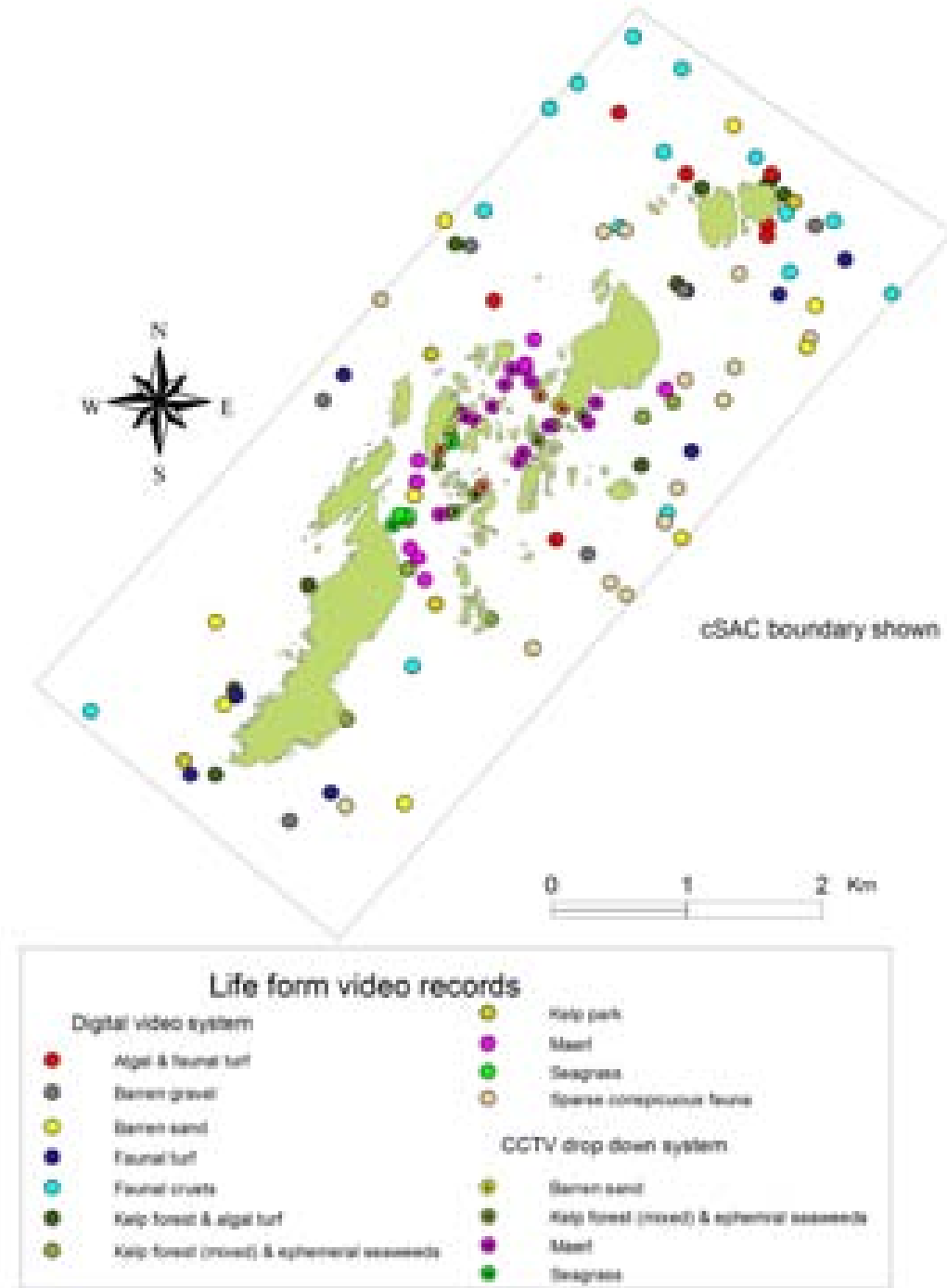


Figure 4.6 - Subtidal biological data mapped, with polygons named and coloured according to Life Form scheme (Foster-Smith et al. 2000), Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))

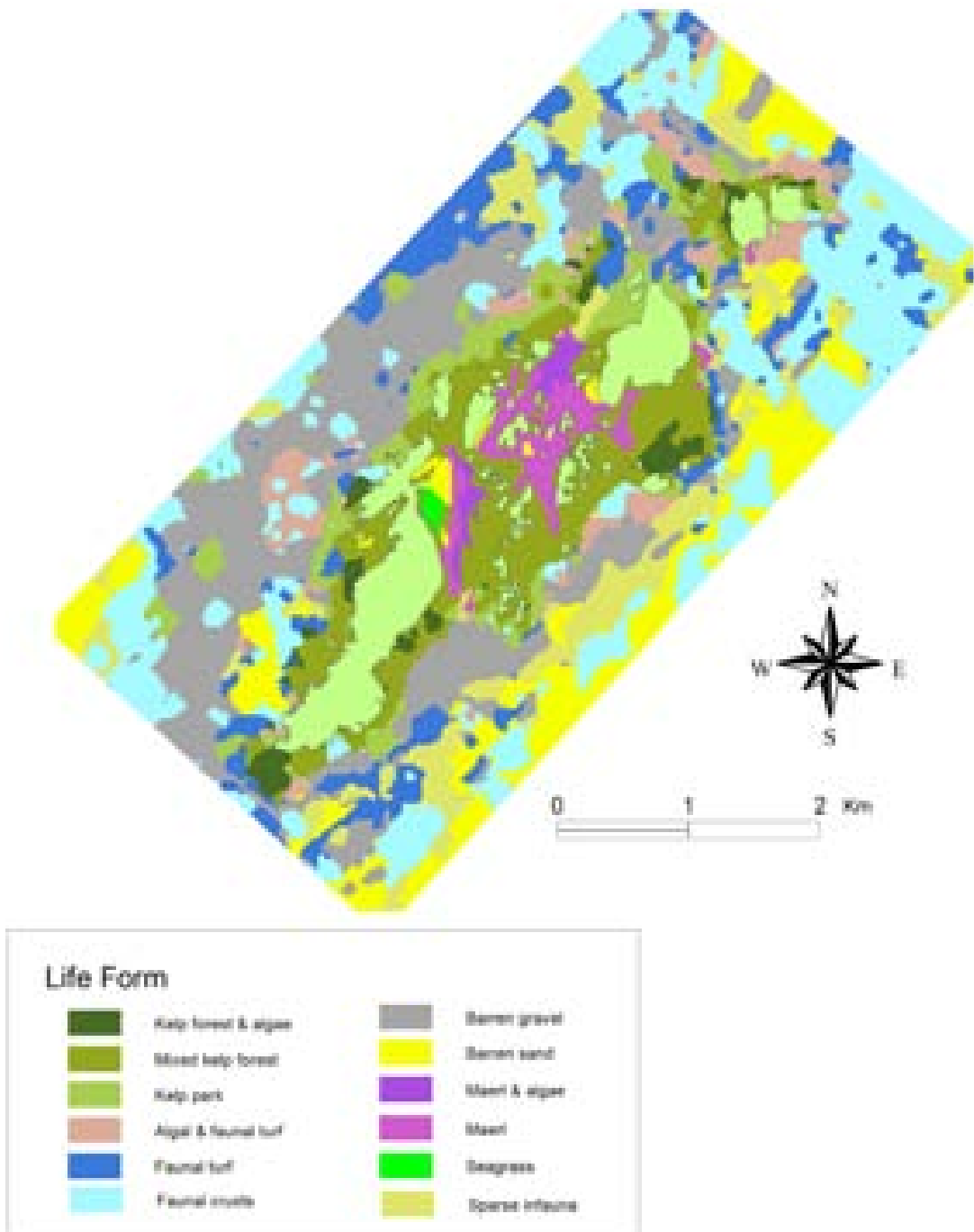




Figure 4.7 – Biotopes identified at each drop-down video station, named and coloured according to MNCR scheme (Connor et al. 1997b), Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))

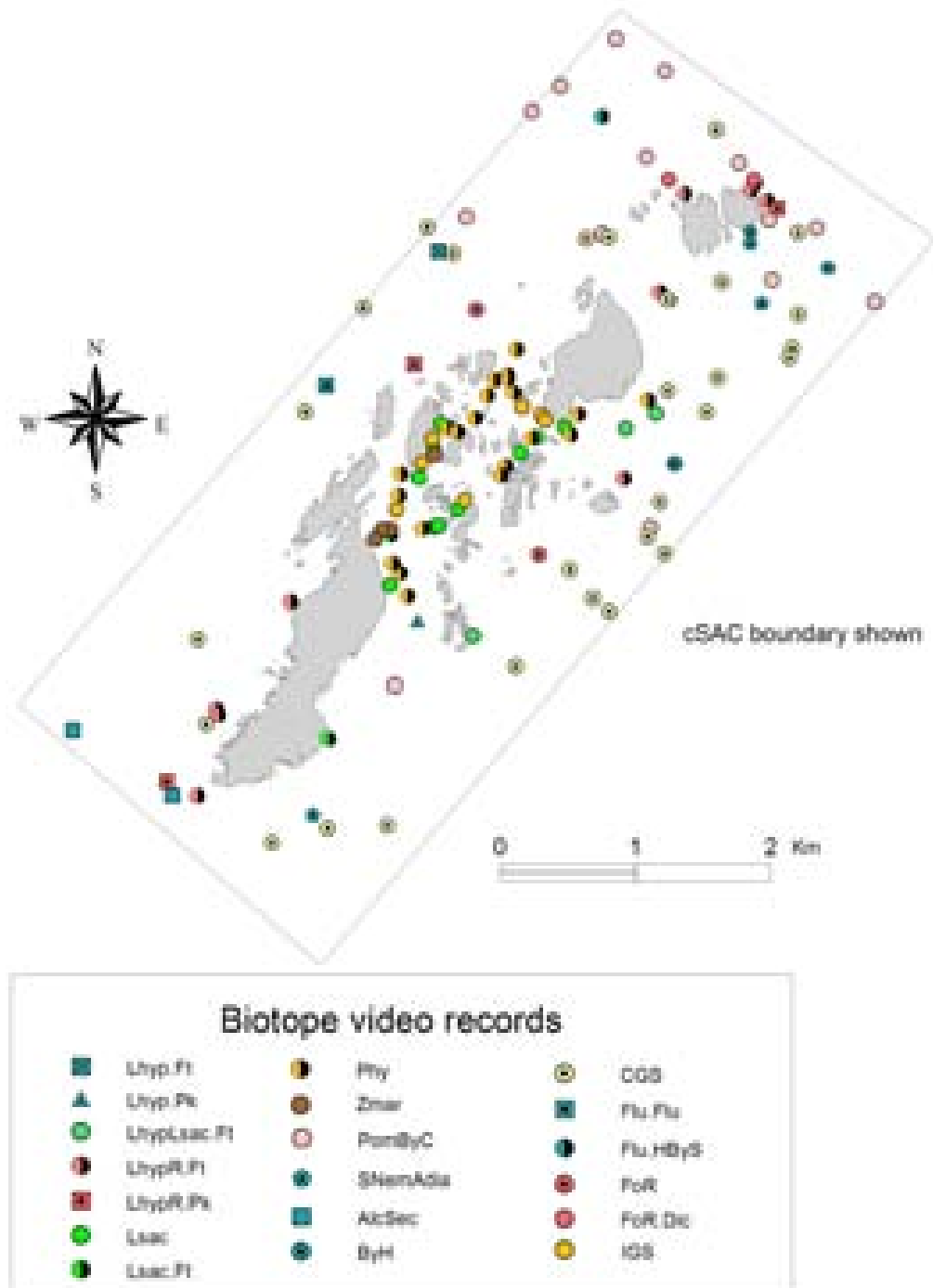
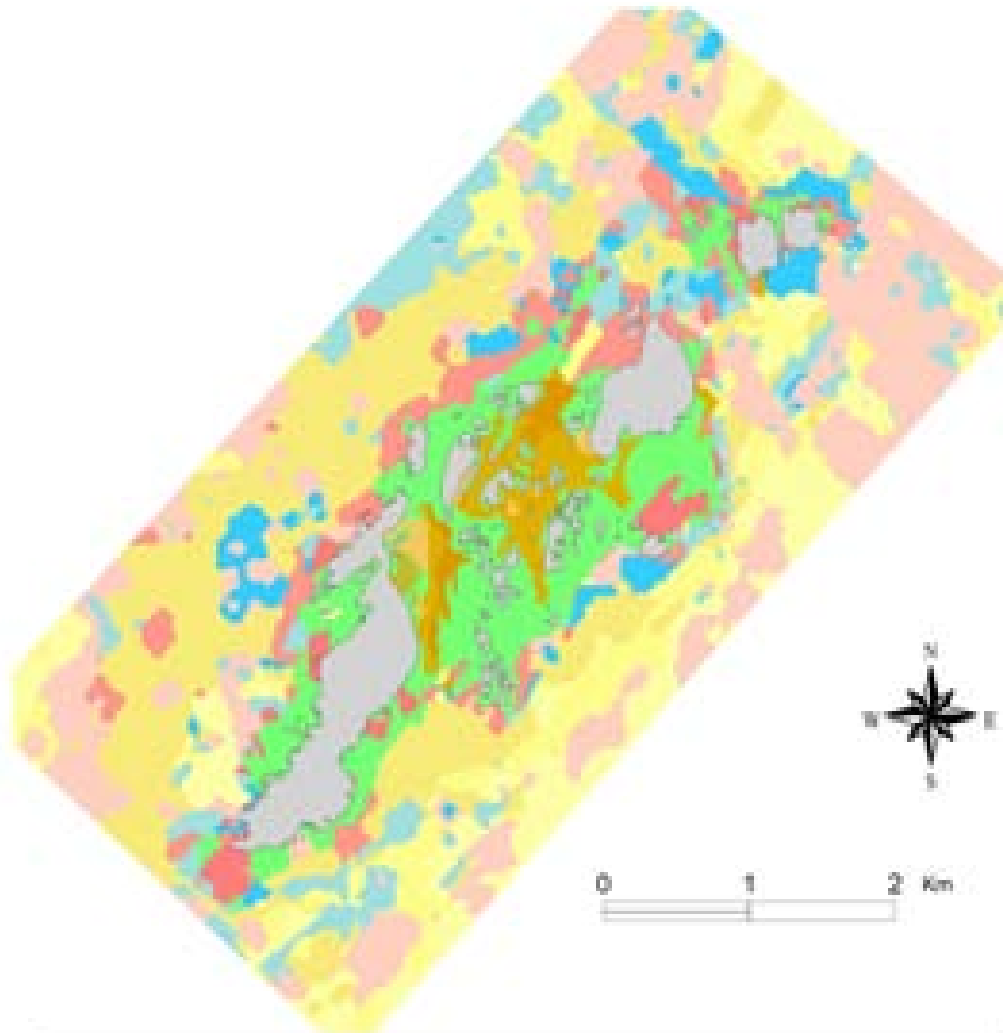


Figure 4.8 - Subtidal biotope distribution, named and coloured according to MNCR scheme (Connor et al. 1997b), Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))



Biotores			
	Lhyp.Pt & LhypR.Pt		CGS (sparse fauna)
	LhypLact.Pt, Lact & Lact.Pt		CGS (barren gravel)
	Lhyp.Pt & LhypR.Pt		CGS (barren sand)
	FoR & FoR.Dc		Phy
	BpR, Flu.Flu, AnSes, Flu.HByS, AnSes & SMarAde		Zmar
	FamilyC		Phy (& algae)
			CGS (barren sand)

Table 4.3 - Intertidal biotope listing with summary habitat and species information, Treshnish Isles biotope mapping survey, August 2003

	Biotope	Position	Habitat	Characteristic species
1	LR.YG	All around the Treshnish Isles, typically extensive on vertical cliff faces on the larger islands, and in smaller areas on some of the more sheltered smaller islets and rocks.	Vertical or horizontal supralittoral bedrock at tops of sea-cliffs, or boulders backing sloping rocky beaches.	Yellow and grey lichens, including <i>Caloplaca</i> spp., <i>Xanthoria parietina</i> , <i>Lecanora atra</i> and <i>Ramalina</i> sp.
2	LR.Pra	Observed at one location on Sgeir a' Chaisteil at the northern end of Lunga.	Horizontal bedrock in upper shore and supralittoral, with bird guano.	The green alga <i>Prasiola stipitata</i> was present in small quantities with black, yellow and grey lichens.
3	LR.Ver	All around the Treshnish Isles, common on the lower half of the tall cliff faces backing much of the shoreline. Also fringing the tops of some of the lower limpet/barnacle dominated vertical rock walls at the waters' edge, e.g. along south coast of Fladda.	Exposed to sheltered mid and upper shore bedrock, predominantly vertical or steeply sloping.	The black lichen <i>Verrucaria maura</i> . Typically not surveyed to the detail of the closely related and similar but accessible LR.Ver.B.
4	LR.Ver.Por	Recorded as small isolated occurrences on east and west coasts of north Lunga. Also as sub-biotope within SLR.Fspi or LR.Ver.B biotopes on Fladda and south Lunga.	Exposed to sheltered mid and upper shore upward facing sloping bedrock.	The black lichen <i>Verrucaria maura</i> and the brown alga <i>Pelvetia canaliculata</i> as main cover.
5	LR.Ver.B	Common around Lunga, and with one occurrence on Sgeir na h-Iolaire.	Exposed to sheltered upper eulittoral bedrock and large boulders.	The black lichen <i>Verrucaria maura</i> , with barnacles (both <i>Semibalanus balanoides</i> and <i>Chthamalus</i> spp.) and <i>Patella</i> spp.
6	ELR.MytB	Recorded twice; once on southeast corner of Lunga, and as part of a near-vertical profile on the northwest coast of Sgeir a' Chaisteil.	Exposed steep or vertical bedrock in lower shore and sublittoral fringe.	Dominated by <i>Semibalanus balanoides</i> , <i>Mytilus edulis</i> and <i>Patella</i> spp., and a range of small foliose and filamentous red algae including <i>Mastocarpus stellatus</i> , <i>Callithamnion</i> sp., <i>Ceramium</i> sp. and <i>Porphyra umbilicalis</i> .
7	ELR.BPat.Lic	Recorded in small patches around the east and west coasts of Lunga, and on the north side of the islet Sgeir na h-Iolaire. Also recorded as a sub-biotope within ELR.BPat.Sem down the east side of Lunga.	Exposed to sheltered steeply sloping bedrock in upper eulittoral.	<i>Lichina</i> sp. dominant, together with <i>Chthamalus</i> spp. and <i>Patella</i> spp. <i>Porphyra umbilicalis</i> , <i>Littorina neritoides</i> , <i>Pelvetia canaliculata</i> and <i>Porphyra umbilicalis</i> also usually present in varying amounts.
8	ELR.BPat.Fvesl	On exposed north or northwest-facing shores of Cairn na Burgh More, Sgeir an Eirionnaich, Tighchoie, Sgeir a' Chaisteil, south Lunga, and on many of the low-lying rocks and islets between Fladda and Lunga.	Very exposed or exposed bedrock terraces (horizontal) in lower shore or lower mid shore.	Barnacles dominant, mostly <i>Semibalanus balanoides</i> , together with <i>Patella</i> spp., <i>Fucus vesiculosus</i> var <i>linearis</i> and <i>Enteromorpha</i> sp. present. A wide variety of other lower shore species is typically present also.
9	ELR.BPat.Sem	Commonly recorded around most of the islands, islets and the larger rocks where vertical rock occurred in the midshore.	Predominantly vertical bedrock and large boulders in mid shore.	Barnacles and limpets dominant ( <i>Semibalanus balanoides</i> , <i>Chthamalus stellatus</i> and <i>C. montagui</i> all present; <i>S. balanoides</i> dominant lower on shore, whilst <i>Chthamalus</i> spp. are more numerous at higher levels).
10	ELR.Him	On the west side of south Lunga, and on or amongst several of the shallow but mostly submerged rocks between Fladda and Lunga.	Exposed or moderately exposed lower shore bedrock.	<i>Himanthalia elongata</i> , together with kelp species, barnacles and limpets, encrusting coralline algae, and a range of foliose and filamentous red.
11	MLR.PelB	Commonly recorded as a narrow band in the upper shore around all of the larger islands and islets.	Moderately exposed to sheltered upper eulittoral horizontal or sloping bedrock and boulder surfaces.	<i>Verrucaria maura</i> and <i>Pelvetia canaliculata</i> dominant, often with small amounts of <i>Fucus spiralis</i> , <i>Littorina saxatilis</i> , <i>Chthamalus</i> spp. and <i>Littorina neritoides</i> .

Table 4.3 - Continued

	<b>Biotope</b>	<b>Position</b>	<b>Habitat</b>	<b>Characteristic species</b>
12	MLR.FvesB	Frequent throughout the island group.	Mid eulittoral bedrock exposed or moderately exposed to wave action.	Characterised by <i>Semibalanus balanoides</i> and <i>Fucus vesiculosus</i> , but also with <i>Patella vulgata</i> , small <i>Mytilus edulis</i> , <i>Enteromorpha</i> sp., <i>Porphyra umbilicalis</i> , and small amounts of <i>Laminaria digitata</i> .
13	MLR.Fser	One or two small patches noted on Sgeirean na Giusaich, a group of rocks and reefs in the archipelago between Fladda and Lunga.	Moderately exposed upward facing bedrock in lower shore.	Dominated by <i>Fucus serratus</i> and <i>F. vesiculosus</i> , together with <i>Semibalanus balanoides</i> and a wide variety of lower shore species.
14	MLR.Pal	Recorded as a sub-biotope only within MLR.Ent on southeast side of Lunga.	Unstable eulittoral boulders and cobbles.	<i>Palmaria palmata</i> and <i>Enteromorpha</i> sp.
15	MLR.Ent	In small localised patches on the larger islands, often in the entrance to gullies cutting back into cliff faces.	Unstable eulittoral boulders and cobbles.	<i>Enteromorpha</i> sp. (often only viewed from a distance).
16	SLR.Pel	Recorded once, on a rocky platform on the stony spit extending off the north tip of Lunga.	Sheltered upper shore bedrock.	<i>Pelvetia canaliculata</i> , <i>Verrucaria maura</i> and <i>Fucus spiralis</i> .
17	SLR.Fspi	Very restricted, and localised to two sheltered inlets on Fladda, plus minor occurrences on Sgeir na h-Iolaire and Sgeir an Fheoir.	Sheltered upper shore bedrock.	<i>Fucus spiralis</i> , <i>Porphyra umbilicalis</i> and <i>Pelvetia canaliculata</i> .
18	SLR.Fves	Restricted to single sheltered inlet at the north end of Lunga.	Sheltered mid eulittoral bedrock.	<i>Fucus vesiculosus</i> .
19	SLR.Asc.Asc	Restricted to small localised areas of shelter, such as east side of Sgeir an Eirionnaich, Sgeir an Fheoir and within the sound between Cairn na Burgh More and Cairn na Burgh Beg.	Sheltered bedrock and boulders in midshore.	<i>Ascophyllum nodosum</i> , <i>Fucus vesiculosus</i> , <i>Fucus serratus</i> , <i>Polysiphonia lanosa</i> (on <i>A. nodosum</i> ), encrusting coralline algae, and a wide range of smaller plants and animals.
20	SLR.Fserr	Found throughout cSAC, but in small localised patches of shelter within inlets.	Sheltered upward facing bedrock or boulders in lower shore.	<i>Fucus serratus</i> and <i>F. vesiculosus</i> , together with a wide variety of lower shore species.
21	SLR.BLlit	Found in small patches on west coast of Lunga and on southeast coast of Sgeir a'Chaisteil.	Unstable eulittoral boulders and cobbles, typically in or near gully openings.	Variable but usually with sparse cover of barnacles and limpets, sparse fucoids or <i>Enteromorpha</i> sp., and littorinids.
22	SLR.AscX	Within large sheltered inlets of Fladda only.	Sheltered midshore boulders and mixed sediment.	<i>Ascophyllum nodosum</i> , <i>Polysiphonia lanosa</i> (on <i>A. nodosum</i> ), and <i>Fucus vesiculosus</i> .
23	SLR.EphX	Found at three locations around the north end of Lunga.	Upper eulittoral small boulders, cobbles and pebbles overlying damp gravel.	A sparse fauna including littorinids and <i>Actinia equina</i> under the larger stones, with rare occurrences of <i>Enteromorpha</i> sp. and <i>Porphyra umbilicalis</i> .
24	SLR.FcerX	A single occurrence of this biotope was recorded at the head of the southern inlet on Fladda, where a stream ran down the shore.	Sheltered lower shore boulders, cobbles and pebbles on gravel, influenced by fresh water stream.	<i>Fucus ceranoides</i> and <i>F. spiralis</i> .
25	LR.G	Large green rock pools common around the cSAC, with small pools even more widespread as sub biotopes within upper shore habitats.	Upper shore rock pools of various sizes, within bedrock.	<i>Enteromorpha</i> sp. mainly, often with bleached encrusting coralline alga and spirorbid polychaetes.
26	LR.Cor	Occasionally large enough to map, but usually recorded as subsidiary biotope in mid or upper shore habitats.	Mid to upper shore rock pools of various sizes, within bedrock.	Dominated by encrusting coralline algae, but also with <i>Corallina officinalis</i> , <i>Actinia equina</i> , <i>Patella vulgata</i> (with tassels of <i>Enteromorpha</i> sp.), <i>Mytilus edulis</i> (small) and <i>Nucella lapillus</i> .

Table 4.3 - Continued

	<b>Biotope</b>	<b>Position</b>	<b>Habitat</b>	<b>Characteristic species</b>
27	LR.FK	Several large kelp-dominated pools occur on the wider rocky plateaus found intertidally in the southern half of Lunga and on Cairn na Burgh More. Occasionally recorded as a sub-biotope.	Large lower or mid shore rock pools, sheltered to moderately exposed.	<i>Laminaria digitata</i> , <i>Alaria esculenta</i> and <i>Fucus serratus</i> dominate typically, but also with encrusting coralline algae, <i>Corallina officinalis</i> , and <i>Semibalanus balanoides</i> .
28	LGS.BarSh	Found on most of the larger islands, typically in gullies and on or above the upper shore.	Moderately exposed, dry, supralittoral and upper shore cobbles.	Not surveyed in detail, but talitrid amphipods noted at many sites.
29	LGS.S	Found at one location on the west coast of Fladda, as a small patch of sand in the mid shore.	Mid shore coarse sand sheltered from direct wave action by intertidal reefs.	None recorded (viewed from a distance).
30	LGS.AP.P	A single occurrence in the large north-facing inlet on Fladda. Visible on aerial photos as white 'sand' areas down centre of inlet.	Sheltered lower shore shelly sand with pebbles.	Casts of <i>Arenicola marina</i> , plus tubes of <i>Lanice conchilega</i> and shells of <i>Cerastoderma edule</i> .
31	EIR.Ala.Ldig	Occurred all around the islands.	Exposed or moderately exposed sublittoral fringe bedrock on the open coast.	<i>Laminaria digitata</i> and <i>Alaria esculenta</i> co-dominate in this band, whilst the rock surface is covered with encrusting coralline algae and barnacles.
32	MIR.Ldig	All around the islands, but densest in gullies and inlets and areas of shelter.	Sheltered to exposed bedrock in lower shore and sublittoral fringe.	Dominated by <i>Laminaria digitata</i> , and also with <i>Mastocarpus stellatus</i> , <i>Fucus serratus</i> , <i>Dilsea carnosa</i> (on kelp stipes), encrusting coralline algae, and a range of smaller plants and animals.
33	Unnamed	Occurred as a sub-biotope within BPat.Sem on west side of Lunga.	Exposed or moderately exposed mid eulittoral bedrock.	Dense patches of <i>Mytilus edulis</i> , <i>Mastocarpus stellatus</i> and <i>Corallina officinalis</i> within the barnacle and limpet zone.

Figure 4.9- Map location aid and key to biotopes, Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))

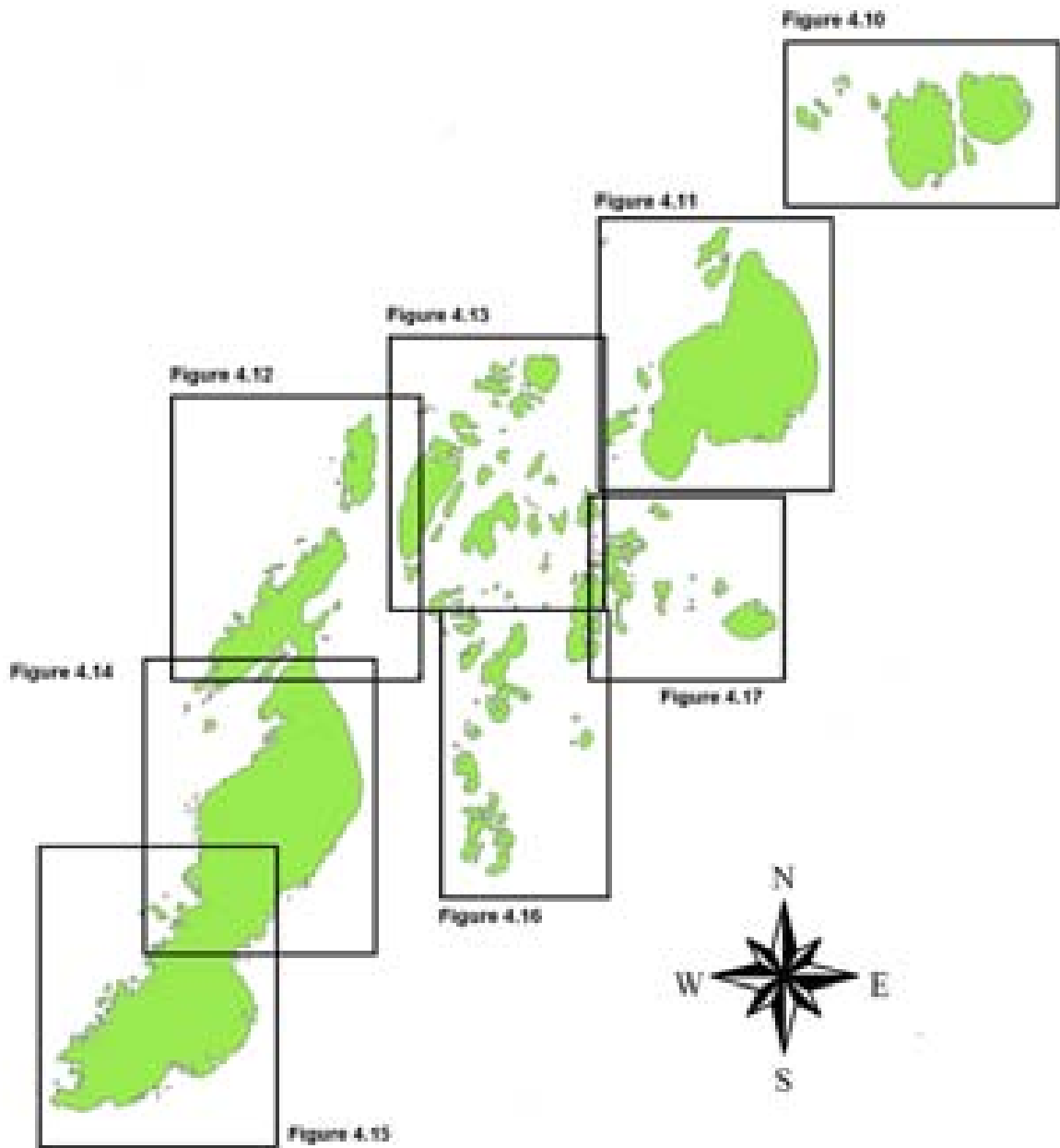
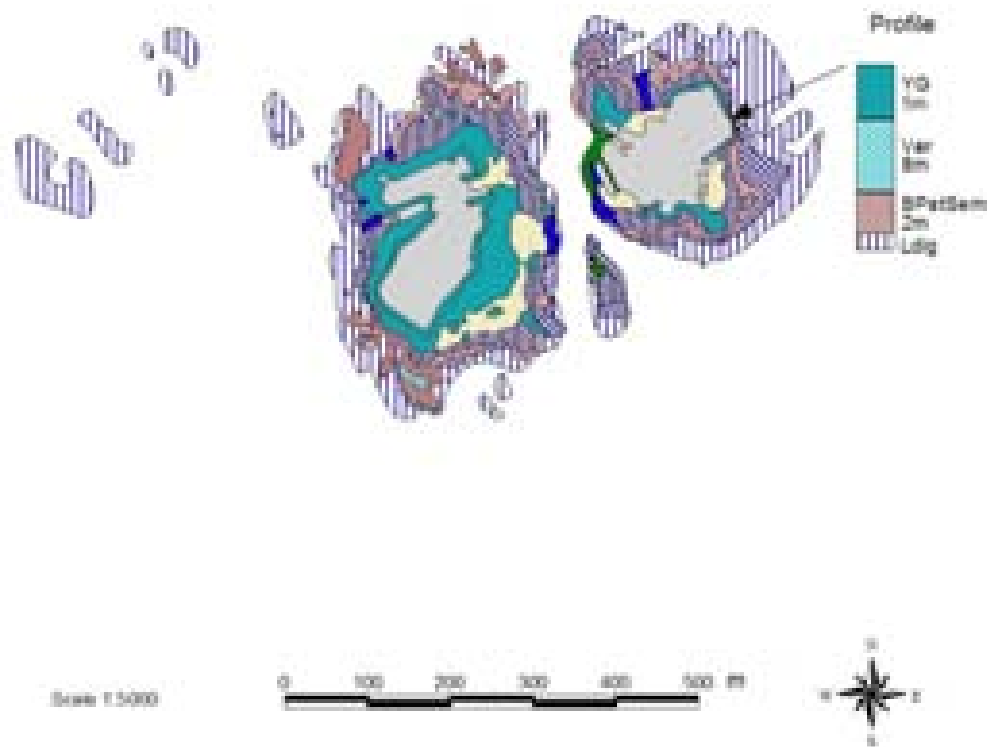


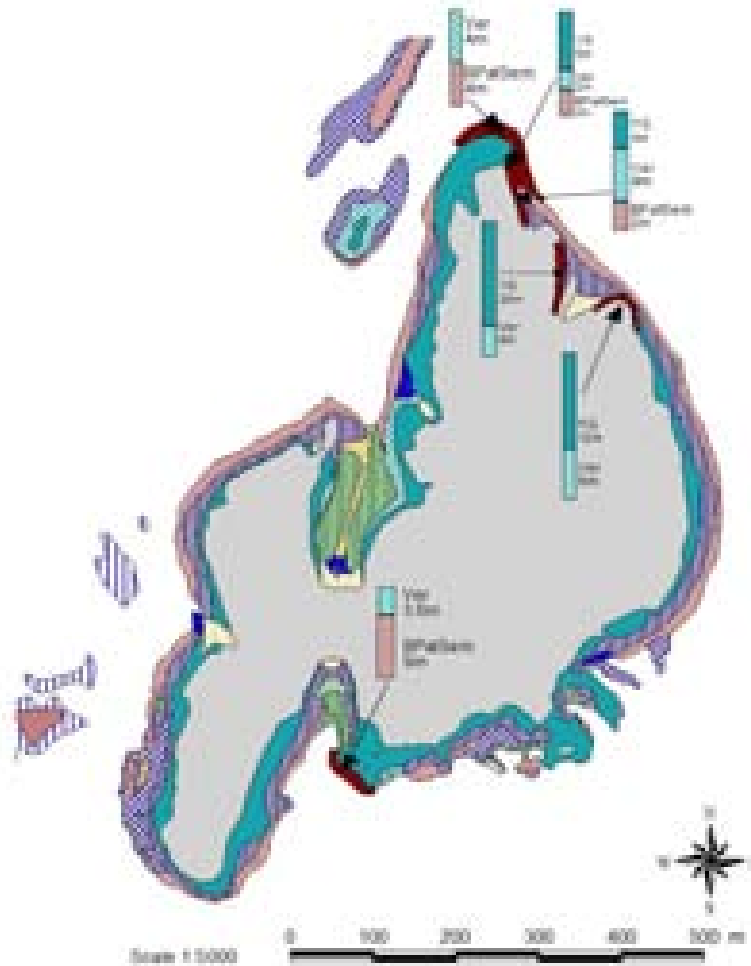
Figure 4.10 Intertidal biotope distribution around the Cairn na Burgh More and Cairn na Burgh Beg; coloured to MNCR scheme (Connor et al. 1997a) except for lichen biotopes, which are coloured according to the Life Forms scheme (Foster-Smith et al. 2001), Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))



### Littoral biotopes

Exposed rock	Sheltered rock	Various littoral rock	Littoral gravel & sand
Ala.Ldig	Asc.Asc	Cor	AP
BPat.Fvesl	AscX	FK	BerSh
Bpat.Lic	BLit	G	S
BPat.Sem	EphX	Pra	
Him	FcerX	Ver	Cliff profile
MytB	Fserr	VerB	Profile
	Fspi	VerPor	
Moderately exposed rock		YG	Land
Ent	Fves		Grass
FvesB	Pel		
Ldig			
PelB			

Figure 4.11 - Intertidal biotope distribution around Fladda; coloured to MNCR scheme (Connor et al. 1997a) except for lichen biotopes, which are coloured according to the Life Forms scheme (Foster-Smith et al. 2001), Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))

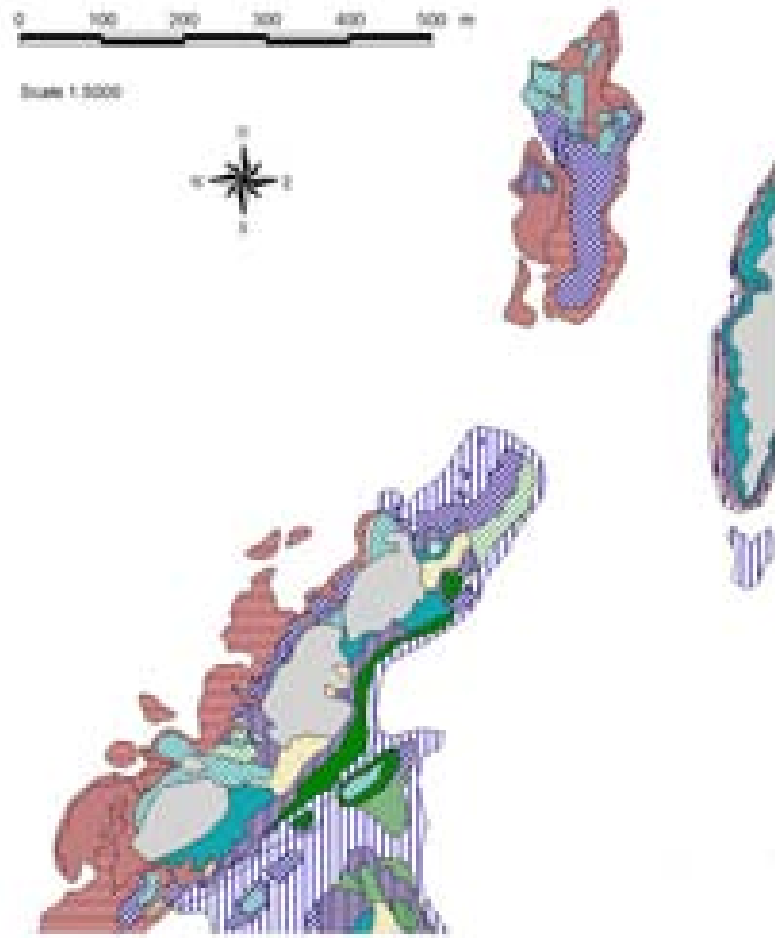


### Littoral biotopes

Exposed rock	Sheltered rock	Various littoral rock	Littoral gravel & sand
Ala.Ldig	Asc.Asc	Cor	AP
BPat.Fvesl	AscX	FK	BerSh
Bpat.Lic	BLit	G	S
BPat.Sem	EphX	Pra	
Him	FcerX	Ver	Cliff profile
MytB	Fserr	VerB	Profile
	Fspi	VerPor	
Moderately exposed rock		YG	Land
Ent	Fves		Grass
FvesB	Pel		
Ldig			
PelB			



Figure 4.12- Intertidal biotope distribution around Tighchoie and Sgeir a' Chaisteil; coloured to MNCR scheme (Connor et al. 1997a) except for lichen biotopes, which are coloured according to the Life Forms scheme (Foster-Smith et al. 2001), Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))



### Littoral biotopes

Exposed rock	Sheltered rock	Various littoral rock	Littoral gravel & sand
Ala.Ldig	Asc.Asc	Cor	AP
BPat.Fvesl	AscX	FK	BerSh
Bpat.Lic	BLit	G	S
BPat.Sem	EphX	Pra	
Him	FcerX	Ver	Cliff profile
MytB	Fserr	VerB	Profile
	Fspi	VerPor	
Moderately exposed rock	Fves	YG	Land
Ent	Pel		Grass
FvesB			
Ldig			
PelB			

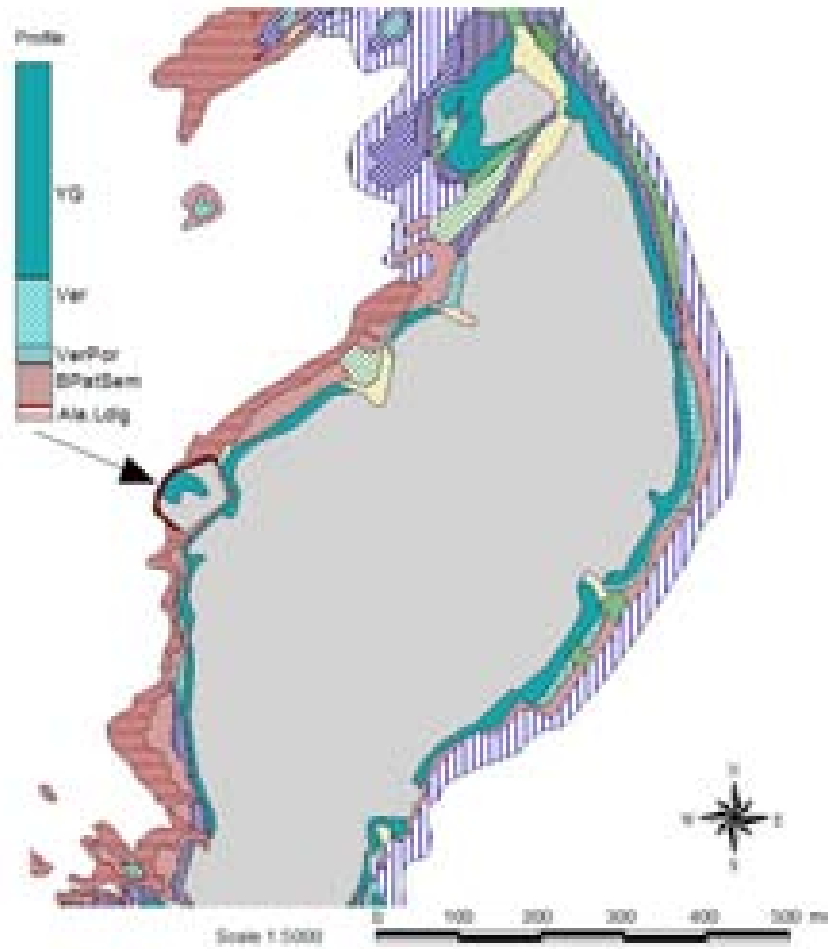
Figure 4.13 - Intertidal biotope distribution around Sgeir an Eirionnaich, Sgeir na h-Iolaire and Sgeir an Fheoir; coloured to MNCR scheme (Connor et al. 1997a) except for lichen biotopes, which are coloured according to the Life Forms scheme (Foster-Smith et al. 2001), Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))



**Littoral biotopes**

Exposed rock	Sheltered rock	Various littoral rock	Littoral gravel & sand
Ala.Ldig	Asc.Asc	Cor	AP
BPat.FvesI	AscX	FK	BerSh
Bpat.Lic	BLit	G	S
BPat.Sem	EphX	Pra	Cliff profile
Him	FcerX	Ver	Profile
MytB	Fserr	VerB	
	Fspi	VerPor	
Moderately exposed rock	Fves	YG	Land
Ent	Pel		Grass
FvesB			
Ldig			
PelB			

Figure 4.14 - Intertidal biotope distribution around north half of Lunga; coloured to MNCR scheme (Connor et al. 1997a) except for lichen biotopes, which are coloured according to the Life Forms scheme (Foster-Smith et al. 2001), Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage 100017908 (2009))



### Littoral biotopes

Exposed rock	Moderately exposed rock	Variable littoral rock	Littoral grass & sand
AA.Ldg	AAu.Ban	Col	AP
SPat.Fossil	AAu.H	FR	AAu.H
SPat.Lin	AAu.M	G	G
SPat.Sem	AAu.P	Prs	Col profile
AAu	AAu.R	Var	Profile
AAu.H	AAu.F	AAu.Por	Land
AAu.Ldg	AAu.P	YG	Grass
AAu.H	AAu.P		
AAu.H	AAu.P		

Figure 4.15 - Intertidal biotope distribution around southern half of Lunga; coloured to MNCR scheme (Connor et al. 1997a) except for lichen biotopes, which are coloured according to the Life Forms scheme (Foster-Smith et al. 2001), Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))



### Littoral biotopes

Exposed rock	Sheltered rock	Various littoral rock	Littoral gravel & sand
Ala.Ldig	Asc.Asc	Cor	AP
BPat.Fvesl	AscX	FK	BerSh
Bpat.Lic	BLlit	G	S
BPat.Sem	EphX	Pra	
Him	FcerX	Ver	Cliff profile
MytB	Fserr	VerB	Profile
	Fspi	VerPor	
	Fves	YG	Land
	Pel		Grass
Moderately exposed rock			
Ent			
FvesB			
Ldig			
PelB			

Figure 4.16 - Intertidal biotope distribution around Sgeirean na Giusaich and Sgeirean Mor; coloured to MNCR scheme (Connor et al. 1997a) except for lichen biotopes, which are coloured according to the Life Forms scheme (Foster-Smith et al. 2001), Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009 All rights reserved. Scottish Natural Heritage. 100017908 (2009))



### Littoral biotopes

Exposed rock	Sheltered rock	Various littoral rock	Littoral gravel & sand
Ala.Ldig	Asc.Asc	Cor	AP
BPat.Fvesl	AscX	FK	BerSh
Bpat.Lic	BLit	G	S
BPat.Sem	EphX	Pra	
Him	FcerX	Ver	Cliff profile
MytB	Fserr	VerB	Profile
	Fspi	VerPor	
Moderately exposed rock	Fves	YG	Land
Ent	Pel		Grass
FvesB			
Ldig			
PelB			

Figure 4.17 - Intertidal biotope distribution around Bogha Ruadh; coloured to MNCR scheme (Connor et al. 1997a) except for lichen biotopes, which are coloured according to the Life Forms scheme (Foster-Smith et al. 2001), Treshnish Isles biotope mapping survey, August 2003. (© Crown copyright 2009. All rights reserved. Scottish Natural Heritage. 100017908 (2009))



### Littoral biotopes

Exposed rock	Sheltered rock	Various littoral rock	Littoral gravel & sand
Ala.Ldig	Asc.Asc	Cor	AP
BPat.Fvesl	AscX	FK	BerSh
Bpat.Lic	BLit	G	S
BPat.Sem	EphX	Pra	
Him	FcerX	Ver	Cliff profile
MytB	Feerr	VerB	Profile
	Fspi	VerPor	
Moderately exposed rock	Fves	YG	Land
Ent	Pel		Grass
FvesB			
Ldig			
PelB			

## 5 DISCUSSION

### 5.1 Biotope data

#### *Subtidal*

As related in Section 3.2.2, the overall Kappa agreement for the life form and seabed type maps was 0.61 and 0.59 respectively. This level of agreement is typical of remote surveys, where perfect agreement is never expected due to a combination of positional error and variability in the acoustic reflectance data, and the classification is considered successful.

A proportion of the apparent inaccuracy can be illustrated by cross-tabulating the ground truth image data and the predicted life form distribution (Table 5.1). This compares pixels from the ground truth image (what was actually observed) with pixels from the same position from the classified image. The shaded cells on the table diagonal show the number of correctly predicted pixels, whilst those cells off the diagonal show the wrongly predicted pixels. Those in the upper right corner of the table show false predictions of occurrence whilst those in the lower left corner are false predictions of absence. The major confusion has occurred between the various kelp life forms or biotopes, and similarly between the gravel/sand biotopes, which show considerable overlap in life form and habitat requirements.

*Table 5.1 - Cross-tabulation of predicted image and ground truth image (number of shared pixels), Treshnish biotope mapping survey, August 2003*

Classified image (predicted)	Ground truth image										
	Kelp forest and algal turf	Kelp forest (mixed) and ephemeral seaweeds	Kelp park	Algal and faunal turf	Bryozoan/hyroid turf	Faunal crusts and turf	Sparse conspicuous fauna	Barren gravel	Barren sand	Maerl	Seagrass
Kelp forest and algal turf	65	10	2	1	2	0	0	0	0	0	0
Kelp forest (mixed) and ephemeral seaweeds	14	45	0	0	0	1	0	0	0	6	0
Kelp park	5	3	42	6	1	0	0	0	0	1	0
Algal and faunal turf	3	0	0	66	0	19	0	0	0	0	0
Bryozoan/hyroid turf	1	0	0	0	55	23	11	7	2	0	0
Faunal crusts and turf	1	0	0	0	2	74	14	1	8	0	0
Sparse conspicuous fauna	0	0	0	0	1	33	78	1	21	0	0
Barren gravel	0	0	0	0	16	21	37	46	12	0	0
Barren sand	1	0	0	0	0	1	27	8	55	3	0
Maerl	0	1	1	0	0	0	0	0	11	70	0
Seagrass	0	0	0	0	0	0	0	0	0	0	17

Thus Tables 4.1 and 4.2 showed how the biota and biotopes overlap a range of habitats, whilst Table 5.1 illustrates the acoustic overlap that has inevitably resulted in confusion between biotopes of similar composition and appearance.

These features are likely to be a consequence of the overriding influence of high wave energy in the area, and resultant scouring, which has resulted in the predominant biota on

rock, boulder and cobble surfaces comprising *Pomatoceros triqueter*, *Balanus* sp. (most likely to be *B. crenatus*) and a variable coverage of encrusting coralline algae. These encrusting species occurred on almost all rock surfaces, even where they were overgrown by bryozoan and hydroid turfs (deeper water), mixed algal and faunal turfs or even kelp parks and forests (shallower water). There was a notable lack of diversity in the faunal turfs, with no significant occurrence of sponges.

The shelter from prevailing weather and sea conditions afforded amongst the islets between Lunga and Fladda has allowed well developed forests of mixed kelp species to occur, along with an extensive network of maerl beds and a bed of the eel grass *Zostera marina*.

As highlighted in the earlier methods and results sections, the mapping process for the subtidal area of the cSAC has been weakest along the southern half of the eastern boundary, where the sea bed slopes rapidly off to depths of 100m. This was due to limitations of the AGDS when optimised for the shallower major part of the sSAC, and of the maximum practicable sampling depth for the camera system employed. The interpretation of data below 45-60m must therefore be viewed with caution, and this trough may need targeted sampling if it is considered as an important feature of the site.

### *Intertidal*

The shores of the Treshnish Isles were predominantly open, rocky and steep, and on the larger islands tended to be exposed on the south and west coasts, and moderately exposed on the east and north coasts. Shores were generally narrow, steep and backed by cliffs, although more extensive intertidal rocky plateaux occasionally occurred on the more exposed coasts. Such shores were generally characterised by barnacles and limpets, though fucoids were typically present also (rarely dominating), notably *Fucus vesiculosus* f. *linearis* on the most exposed western shores. These most exposed shores, for example on the southern tip of Lunga, and the west coasts of Sgeir a' Chaisteil and Tighchoie, had notable mid-shore rock pools with fucoid and kelp communities, some of which were several metres deep and large enough to be mapped individually.

Biotope diversity was augmented by the occurrence of two sizeable inlets on the island of Fladda; the south-facing one contained mostly cobble and small boulder habitats, and had a small freshwater stream at its head resulting in the occurrence of *Fucus ceranoides*. The north-facing inlet on Fladda was wider and flatter, and contained a central area of coarse sand in the lower shore flanked by mid eulittoral sheltered boulders.

Biotope diversity was additionally raised by the small islets, reefs and rocks clustered within the shallows between Lunga and Fladda. Generally these were less exposed than the larger islands, and supported often extensive areas of kelp (both *Alaria esculenta* and *Laminaria digitata* were noted) together with *Himanthalia elongata* and some of the more sheltered fucoid-dominated biotopes.

## **5.2 Comparison with previous data**

Although there are no other sublittoral datasets based on AGDS and video from similar sites in this area of west Scotland for direct comparison, the wave-exposed and scoured character of much of the sea bed in the cSAC seems similar to the observations made from the manned submersible by Eden *et al.* (1971). However, whilst sparse brittlestar beds certainly were recorded in the present survey, there were no observations of the Ross coral *Pentapora foliacea* from the video footage obtained. In addition, the presence of maerl beds amongst the reefs and islets between Lunga and Fladda is noteworthy and is probably



analogous in situation to those characterising the Sound of Iona further south, and noted originally by Farrow *et al.* (1978).

Whilst the shallower kelp-dominated biotopes noted around the Treshnish Islands may well be similar to those recorded from the open west and northwest coasts of Mull (Davies, 1990), the type of detailed species recording carried out during diving surveys is not comparable to the relatively limited records possible from video footage. For these reasons, comparisons with the 'rich exposed communities' observed around Coll and Tiree (Dipper, 1981 and later Seasearch survey work, unpublished) are not appropriate.

The sea grass *Zostera marina* has been recorded from a number of locations on Scotland's west coast, typically from relatively sheltered locations such as Lochs Sween, Creran and Sunart (Connor & Little, 1998; Connor 1990; Smith 1978). The discovery of a small bed of *Z. marina* in the anchorage on the northeast side of Lunga is probably of minor note, but was unexpected and adds to the marine biological diversity and interest of the archipelago.

With regard to intertidal survey work, the algal records of Price and Tittley (1978a, 1978b) appear generally similar to those of the present survey, especially the records of *Fucus vesiculosus* f. *linearis*, and the presence of *Alaria esculenta* in the sublittoral fringe of exposed shores. However, their survey work involved more detailed recording than in the present broad scale mapping survey, and covered a much greater range of habitats and exposures. There were no records of *Cystoseira* spp. in the present survey, though searches were not instigated and their presence on the islands cannot be ruled out.

### 5.3 Conclusions

Littoral and sublittoral broad scale biotope mapping in the Treshnish Isles identified a total of 52 biotopes. Sublittorally, 19 biotopes were recognised on the basis of video sampling. The greater part of the cSAC consisted of scoured circalittoral boulders, cobbles and sands, either barren of life or with faunal turfs including *Pomatoceros triqueter*, *Balanus* sp., and sparse bryozoans and hydroids. Rocky habitats immediately around the islands supported kelp biotopes, many of which also featured encrusting *P. triqueter*, *Balanus* sp. and encrusting coralline algae. Shore mapping identified 33 biotopes, characterised on the whole by barnacles and limpets with furoid abundance varying according to exposure and rock orientation.

There are no other published marine biological data for the Treshnish Isles, though these results generally tie in with what is known from previous survey work in the inner Hebrides and Scottish west coast.

Records of note include *Fucus vesiculosus* f. *linearis* and *Fucus ceranoides* intertidally, and the presence of a network of maerl beds and a bed of *Zostera marina* subtidally.

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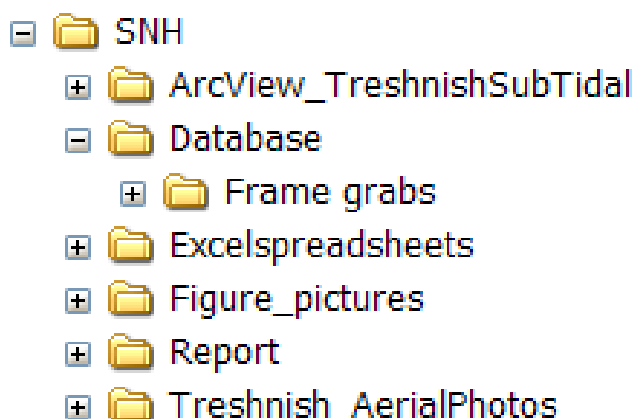
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## APPENDIX 1 – GIS PROJECT OVERVIEW

### A1.1 Folder structure of GIS project supplied separately on CD



#### A1.1.2 Folder 1: ArcView\_TreshnishSubTidal

Contains all ArcView projects and shape files for the maps included in the report. All maps are projected in OSGB36, in units of metres.

*Table A.1 - ArcView projects and shape files used in the maps included in the project*

ArcView Project	Shape files	Figures	Description
Trackpoints2.apr	Meanlowater.shp Treshnishtrackdata.shp	6	Track data showing relative values of variables
Treshnish cSAC.apr	Meanlowater.shp TreshnishcSAC boundary.shp	1	Location map
Treshnish.apr	Meanlowater.shp Lifefrom_region.shp Bathy_contour.shp Sediment_use1_region.shp	7, 10, 12 and 14	Predictive sediment, life form & biotope maps
Video location.apr	Meanlowater.shp Revisdmaster_use_point.shp Videoshallowdrops_use_points.shp	3	Point location of video records
Video point lifeform.apr	Meanlowater.shp Revisdmaster_use_point.shp Videoshallowdrops_use_points.shp Treshnish cSAC.shp	9, 11 & 13	Distribution of sediment, life form & biotope records

#### A1.1.3 Folder 2: Database

The Access database contains all biotope records linked to the frame grabs to be found in the separate subdirectory. Note that these are numbered to concord with the sample numbers and can be used independently of the database for inclusion in any report.

#### A1.1.4 Folder 3: Excelspreadsheets

The video records are also to be found in the spreadsheet **VideoRecords.xls**. The column structure as follows:

Table A2 - Column headers and their descriptions for the file VideoRecords.xls

Column	Description
Record	Video sample record: 1-80 are from the Sony systems, 80-110 notes from the CCTV
East OSGB	6 figure grid reference OSGB36
North OSGB	7 figure grid reference OSGB36
Lat WGS84	Decimal degrees in WGS84
Long WGS84	Decimal degrees in WGS84
Depth (m)	Metres below sea level at time of survey
Habitat (sediment type)	Broad categories of substratum
Habitat No	Number code for habitat (used in image processing)
Life Form Broad	Life form categories based on structure and growth form of conspicuous
Life Form No	Number code for life form (used in image processing)
Biotope complex	MNCR biotope complex version 1997.06
Biotope Code '97	MNCR biotope code version 1997.06
Biotope No	Number code for biotope (used in image processing)
Higher Code	MNCR higher biotope code version 1997.06

The file **Treshnish track data SNH Final.xls** has the final edited version of the AGDS track data with the worksheet **treshnish 2003 edited** with the file structure:

Table A3 - Column headers and their description of RoxAnn data in spreadsheet

Column	Description
Sequential point ID	Numbers indicating the original sequence of track points
eastOSGB	6 figure grid reference OSGB36
northOSGB	7 figure grid reference OSGB36
NdegWGS84	Decimal degrees in WGS84
WdegWGS84	Decimal degrees in WGS84
e1	Raw E1 values
e2	Raw E2 values
Depth pos	Depths corrected to chart datum as positive numbers
SD e1	Standard deviation around each point of 5 previous and 5 following points
SD e2	Standard deviation around each point of 5 previous and 5 following points
SD Raw depth	Standard deviation around each point of 5 previous and 5 following points
Raw depth	Uncorrected depth as negative numbers
Depth correction	Depth corrections for adjusting to chart datum
Depth CD	Corrected depth (to chart datum) as negative numbers
Date	Date (yr m day)
Time( nearest 10mins)	24 hour time to nearest 10 minutes

The file also contains a worksheet **bathy with landline** which has separated out the bathymetry data and added nodes from the OS Landline map with attributes of 0m depth for the low water line and +5m height for the high water line. These data have been used to construct the 3-D terrain model in Vertical Mapper™.

The file also contains a worksheet with the look-up tables used to correct the depth data to chart datum and another with the above Table A3.

#### **A1.1.5 Folder 4: FigurePictures**

Contains the images used in the figures, either as WMF files or BMP files.

#### **A1.1.6 Folder 5: Report**

This report as a Word document

#### **A1.1.7 Folder 6: Treshnish\_Aerialphotos**

ArcView 3 project together with all the associated TIF images. Note that Lunga is called Cruachan. The project uses the OSGB36 projection and metres as units.

The project has four separate sections of the islands and these can be selected and de-selected for viewing. The low water line provides the base map and can be overlain onto the geo-referenced images.

## A1.2 Video records

Table A4 Video records with details of their classification (depth, sediment type, life form and biotope). Note that some samples were divided into two records where there was a marked change in the nature of the seabed during the tow. Note also that the numbers were used to code the categories for purposes of classification of the AGDS images. Treshnish Isles, biotope mapping survey, August 2003

Record	East OSGB	North OSGB	Lat WGS84	Long WGS84	Depth (m)	Habitat (sediment type)	Habitat no	Life form broad	Life form no	Biotope complex	Biotope code '97	Bio-tope no	Higher code
1	131079.43	744893.87	56.519	-6.37382	23	Cobble, gravel and sand	4	Faunal crusts and turf	6	Faunal crusts or short turfs (wave exposed rock)	PomByC	17	ECR.Efa
2	130946.08	745108.56	56.5208	-6.3762	5	Bedrock and boulder	1	Kelp forest and algal turf	1	Kelp with fauna, foliose reds and coralline crusts	LhypR.Ft	13	EIR.KFaR
3	130975.13	745160.63	56.5213	-6.37578	13	Bedrock and boulder	1	Kelp forest and algal turf	1	Kelp with fauna, foliose reds and coralline crusts	LhypR.Ft	13	EIR.KFaR
4	130970.41	745183.25	56.5215	-6.37588	20	Bedrock and boulder	1	Algal and faunal turf	4	Kelp with fauna, foliose reds and coralline crusts	FoR.Dic	7	EIR.KFaR
5	130855.82	745306	56.5226	-6.37787	25	Boulders, cobble and sand	3	Faunal crusts and turf	6	Faunal crusts or short turfs (wave exposed rock)	PomByC	17	ECR.Efa
6	130691.95	745541.86	56.5246	-6.38077	25	Sand, shelly	7	Barren sand	9	Circolittoral gravel and sand	CGS	3	CGS
7	130310.75	745964.1	56.5281	-6.38738	28	Bedrock, boulders, cobble and sand	2	Faunal crusts and turf	6	Faunal crusts or short turfs (wave exposed rock)	PomByC	17	ECR.Efa
8	129948.43	746199.41	56.53	-6.3935	30	Bedrock, boulders, cobble and sand	2	Faunal crusts and turf	6	Faunal crusts or short turfs (wave exposed rock)	PomByC	17	ECR.Efa
9	129538.85	745857.28	56.5268	-6.39978	33	Bedrock and boulder	1	Faunal crusts and turf	6	Faunal crusts or short turfs (wave exposed rock)	PomByC	17	ECR.Efa

A4

Record	East OSGB	North OSGB	Lat WGS84	Long WGS84	Depth (m)	Habitat (sediment type)	Habitat no	Life form broad	Life form no	Biotope complex	Biotope code '97	Bio-tope no	Higher code
10	129843.46	745636.8	56.5249	-6.39462	30	Bedrock and boulder	1	Algal and faunal turf	4	Bryozoan/hydroid turfs (sand influenced)	Flu.HByS	5	MCR.ByH
11	130172.46	745345.9	56.5225	-6.38898	30	Cobble, gravel and sand	4	Faunal crusts and turf	6	Faunal crusts or short turfs (wave exposed rock)	PomByC	17	ECR.Efa
12	130338.98	745184.53	56.5212	-6.38612	19	Cobble, gravel and sand	4	Algal and faunal turf	4	Kelp with fauna, foliose reds and coralline crusts	FoR.Dic	7	EIR.KFaR
13	130453.71	745080.52	56.5203	-6.38415	10	Bedrock and boulder	1	Kelp forest and algal turf	1	Kelp with fauna, foliose reds and coralline crusts	LhypR.Ft	13	EIR.KFaR
14	129330.59	745673.39	56.525	-6.40297	35	Boulders, cobble and sand	3	Faunal crusts and turf	6	Faunal crusts or short turfs (wave exposed rock)	PomByC	17	ECR.Efa
15	128846.72	744913.76	56.5179	-6.41002	36	Boulders, cobble and sand	3	Faunal crusts and turf	6	Faunal crusts or short turfs (wave exposed rock)	PomByC	17	ECR.Efa
16	129861.85	744800.24	56.5175	-6.39345	27	Boulders, cobble and sand	3	Faunal crusts and turf	6	Faunal crusts or short turfs (wave exposed rock)	PomByC	17	ECR.Efa
16.2	129893.75	744768.39	56.5172	-6.3929	27	Gravel and sand	5	Sparse conspicuous fauna	7	Circalittoral gravel and sand	CGS	3	CGS
17	129728.41	744756.66	56.517	-6.39557	25	Gravel and sand	5	Sparse conspicuous fauna	7	Circalittoral gravel and sand	CGS	3	CGS
18	130344.46	744320.91	56.5134	-6.38513	15	Bedrock and boulder	1	Bryozoan/hydroid turf	5	Bryozoan/hydroid turfs (sand influenced)	SNemAdia	18	MCR.ByH
19	130272.62	744372.05	56.5139	-6.38635	15	Bedrock and boulder	1	Kelp forest and algal turf	1	Kelp with fauna, foliose reds and coralline crusts	LhypR.Ft	13	EIR.KFaR



A6

Record	East OSGB	North OSGB	Lat WGS84	Long WGS84	Depth (m)	Habitat (sediment type)	Habitat no	Life form broad	Life form no	Biotope complex	Biotope code '97	Bio-tope no	Higher code
19.2	130323.81	744320.33	56.5134	-6.38547	15	Gravel and sand	5	Barren gravel	8	Circalittoral gravel and sand	CGS	3	CGS
20	126864.9	741867.36	56.4895	-6.43893	26	Sand, shelly	7	Barren sand	9	Circalittoral gravel and sand	CGS	3	CGS
21	131431.62	744836.02	56.5187	-6.36805	45	Boulders, cobble and sand	3	Faunal crusts and turf	6	Faunal crusts or short turfs (wave exposed rock)	PomByC	17	ECR.Efa
22	131062.57	745032.03	56.5202	-6.37423	10	Bedrock and boulder	1	Kelp forest and algal turf	1	Kelp with fauna, foliose reds and coralline crusts	LhypR.Ft	13	EIR.KFaR
23	131294.74	744801.99	56.5183	-6.37023	35	Gravel and sand	5	Barren gravel	8	Circalittoral gravel and sand	CGS	3	CGS
24	131140.27	744977.06	56.5198	-6.37292	16	Bedrock and boulder	1	Kelp park	3	Kelp with fauna, foliose reds and coralline crusts	LhypR.Pk	14	ECR.Efa
25	131516.24	744549.43	56.5162	-6.36638	30	Boulders, cobble and sand	3	Bryozoan/hydroid turf	5	Bryozoan/hydroid turfs (sand influenced)	SNemAdia	18	MCR.ByH
26	131861.44	744300.75	56.5141	-6.36053	32	Boulders, cobble and sand	3	Faunal crusts and turf	6	Faunal crusts or short turfs (wave exposed rock)	PomByC	17	ECR.Efa
27	131296.06	744209.92	56.513	-6.3696	37	Sand, shelly	7	Barren sand	9	Circalittoral gravel and sand	CGS	3	CGS
28	131105.27	744460.2	56.5151	-6.37295	30	Boulders, cobble and sand	3	Faunal crusts and turf	6	Faunal crusts or short turfs (wave exposed rock)	PomByC	17	ECR.Efa
29	130940.15	744725.7	56.5174	-6.3759	20	Cobble, gravel and sand	4	Algal and faunal turf	4	Bryozoan/hydroid turfs (sand influenced)	SNemAdia	18	MCR.ByH

Record	East OSGB	North OSGB	Lat WGS84	Long WGS84	Depth (m)	Habitat (sediment type)	Habitat no	Life form broad	Life form no	Biotope complex	Biotope code '97	Bio-tope no	Higher code
30	130943.46	744809.44	56.5182	-6.37593	20	Bedrock and boulder	1	Algal & faunal turf	4	Faunal crusts or short turfs (wave exposed rock)	SNemAdia	18	MCR.ByH
31	130731.96	744444.95	56.5148	-6.37898	30	Sand, medium fine	8	Sparse conspicuous fauna	7	Circalittoral gravel and sand	CGS	3	CGS
32	131027.83	744294.01	56.5136	-6.37403	25	Boulders, cobble and sand	3	Bryozoan/hydroi d turf	5	Bryozoan/hydroid turfs (sand influenced)	SNemAdia	18	MCR.ByH
33	131253.98	743968.91	56.5108	-6.37003	35	Gravel and sand	5	Sparse conspicuous fauna	7	Circalittoral gravel and sand	CGS	3	CGS
33.2	131230.02	743900	56.5102	-6.37035	35	Sand, medium fine	8	Barren sand	9	Circalittoral gravel and sand	CGS	3	CGS
34	130700.12	743753.07	56.5086	-6.37878	40	Sand waves and boulders	9	Sparse conspicuous fauna	7	Circalittoral gravel and sand	CGS	3	CGS
35	130333.13	743661.1	56.5075	-6.38463	20	Sand, shelly	7	Sparse conspicuous fauna	7	Circalittoral gravel and sand	CGS	3	CGS
36	130187.62	743590.47	56.5068	-6.38692	12	Maerl	6	Maerl	10	Marl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
37	130243.27	743495.37	56.506	-6.38592	15	Boulders, cobble and sand	3	Kelp forest (mixed) & ephemeral seaweeds	2	Silted kelp (stable rock)	LhypLsac.Ft	12	SIR.K
38	128637.47	744666.77	56.5156	-6.41315	15	Bedrock and boulder	1	Kelp forest & algal turf	1	kelp with red seaweeds (moderately exposed rock)	Lhyp.Ft	10	MIR.KR
39	128559.08	744839.27	56.5171	-6.4146	30	Sand, shelly	7	Barren sand	9	Circalittoral gravel and sand	CGS	3	CGS

Record	East OSGB	North OSGB	Lat WGS84	Long WGS84	Depth (m)	Habitat (sediment type)	Habitat no	Life form broad	Life form no	Biotope complex	Biotope code '97	Bio-tope no	Higher code
40	128748.67	744652.13	56.5155	-6.41133	28	Gravel and sand	5	Barren gravel	8	Circalittoral gravel and sand	CGS	3	CGS
41	128919.05	744246.76	56.512	-6.40815	22	Boulders, cobble and sand	3	Algal and faunal turf	4	Kelp with fauna, foliose reds and coralline crusts	FoR	6	EIR.KFaR
42	129214.25	743957.96	56.5095	-6.40307	15	Maerl	6	Maerl	10	Marl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
43	129151.03	743774.14	56.5079	-6.4039	14	Maerl	6	Maerl	10	Marl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
44	128458.25	743848.38	56.5081	-6.4152	18	Bedrock and boulder	1	Kelp park	3	Kelp with fauna, foliose reds and coralline crusts	LhypR.Pk	14	EIR.KFaR
45	128085.41	744257.57	56.5116	-6.42167	25	Sand, shelly	7	Sparse conspicuous fauna	7	Circalittoral gravel and sand	CGS	3	CGS
46	127810.58	743696.67	56.5064	-6.42553	28	Boulders, cobble and sand	3	Bryozoan/hydroid turf	5	Bryozoan/hydroid turfs (sand influenced)	Flu.Flu	4	MCR.ByH
47	127657.34	743507.17	56.5046	-6.42782	20	Gravel and sand	5	Barren gravel	8	Circalittoral gravel and sand	CGS	3	CGS
48	127548.48	742139.79	56.4923	-6.42815	14	Bedrock and boulder	1	Kelp forest and algal turf	1	Kelp with fauna, foliose reds and coralline crusts	LhypR.Ft	13	EIR.KFaR
49	127016.71	741334.39	56.4848	-6.43592	22	Bedrock, boulders, cobble and sand	2	Bryozoan/hydroid turf	5	Kelp with fauna, foliose reds and coralline crusts	LhypR.Ft	13	CGS
49.2	127000.77	741374.49	56.4851	-6.43622	22	Bedrock and boulder	1	Kelp forest and algal turf	1	Kelp with fauna, foliose reds and coralline crusts	LhypR.Ft	13	EIR.KFaR

Record	East OSGB	North OSGB	Lat WGS84	Long WGS84	Depth (m)	Habitat (sediment type)	Habitat no	Life form broad	Life form no	Biotope complex	Biotope code '97	Bio-tope no	Higher code
50	126924.93	741267.76	56.4841	-6.43733	25	Sand, shelly	7	Barren sand	9	Circalittoral gravel and sand	CGS	3	CGS
51	125938.61	741220.27	56.4831	-6.45325	28	Bedrock, boulders, cobble and sand	2	Faunal crusts and turf	6	Faunal crusts or short turfs (wave exposed rock)	AlcSec	1	ECR.Alc
52	126861.61	740751.16	56.4795	-6.43782	15	Bedrock and boulder	1	Kelp forest and algal turf	1	Kelp with fauna, foliose reds and coralline crusts	LhypR.Ft	13	EIR.KFaR
53	126676.2	740750.1	56.4794	-6.44082	23	Boulders, cobble and sand	3	Bryozoan/hydroid turf	5	Alcyonium dominated communities	AlcSec	1	ECR.Alc
53.2	126630.27	740851.65	56.4802	-6.44167	23	Bedrock and boulder	1	Kelp park	3	Kelp with fauna, foliose reds and coralline crusts	LhypR.Pk	14	EIR.KFaR
54	127410.08	740410.48	56.4767	-6.42858	30	Gravel and sand	5	Barren gravel	8	Circalittoral gravel and sand	CGS	3	CGS
55	127823.59	740515.99	56.4779	-6.422	33	Sand, shelly	7	Sparse conspicuous fauna	7	Circalittoral gravel and sand	CGS	3	CGS
55.2	127803.64	740558.14	56.4783	-6.42237	30	Bedrock and boulder	1	Bryozoan/hydroid turf	5	Bryozoan/hydroid turfs (sand influenced)	SNemAdia	18	MCR.ByH
56	128260.45	740536.18	56.4783	-6.41495	40	Sand, shelly	7	Barren sand	9	Circalittoral gravel and sand	CGS	3	CGS
57	127829.06	741159.34	56.4837	-6.42258	16	Boulders, cobble and sand	3	Kelp forest (mixed) and ephemeral seaweeds	2	Silted kelp (stable rock)	Lsac.Ft	16	SIR.K
58	128316.91	741540.98	56.4874	-6.41508	25	Cobble, gravel and sand	4	Faunal crusts and turf	6	Faunal crusts or short turfs (wave exposed rock)	PomByC	17	ECR.Efa

Record	East OSGB	North OSGB	Lat WGS84	Long WGS84	Depth (m)	Habitat (sediment type)	Habitat no	Life form broad	Life form no	Biotope complex	Biotope code '97	Bio-tope no	Higher code
59	128360.14	743060.28	56.501	-6.41597	11	Maerl	6	Maerl	10	Marl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
60	128284.93	742659.43	56.4974	-6.41677	8	Sand, medium fine	8	Seagrass	11	Seagrass beds (sublittoral/lower shore)	Zmar	19	IMS.Sgr
60.2	128282.54	742622.41	56.4971	-6.41677	8	Bedrock and boulder	1	Kelp forest (mixed) and ephemeral seaweeds	2	Silted kelp (stable rock)	Lsac.Ft	16	SIR.K
61	128357.24	742344.08	56.4946	-6.41527	11	Maerl	6	Maerl	10	Marl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
62	128897.29	741890.71	56.4909	-6.40605	9	Bedrock and boulder	1	Kelp forest (mixed) and ephemeral seaweeds	2	Silted kelp (stable rock)	LhypLsac.Ft	12	SIR.K
63	129207.47	741671.74	56.4891	-6.4008	30	Sand, shelly	7	Sparse conspicuous fauna	7	Circalittoral gravel and sand	CGS	3	CGS
64	130019.3	743387.24	56.5049	-6.38943	10	Boulders, cobble and sand	3	Kelp forest (mixed) and ephemeral seaweeds	2	Silted kelp (stable rock)	LhypLsac.Ft	12	SIR.K
65	130618.64	743508.66	56.5063	-6.37985	37	Gravel and sand	5	Sparse conspicuous fauna	7	Circalittoral gravel and sand with epifauna	CGS	3	CGS
66	130381.68	743133.31	56.5028	-6.3833	23	Bedrock and boulder	1	Bryozoan/hydroid turf	5	Bryozoan/hydroid turfs (sand influenced)	ByH	2	MCR.ByH
67	130274.52	742857.39	56.5003	-6.38475	25	Cobble, gravel and sand	4	Sparse conspicuous fauna	7	Circalittoral gravel and sand with epifauna	CGS	3	CGS

Record	East OSGB	North OSGB	Lat WGS84	Long WGS84	Depth (m)	Habitat (sediment type)	Habitat no	Life form broad	Life form no	Biotope complex	Biotope code '97	Bio-tope no	Higher code
68	130008.49	743025.45	56.5017	-6.38923	8	Bedrock and boulder	1	Kelp forest and algal turf	1	Kelp with fauna, foliose reds and coralline crusts	LhypR.Ft	13	EIR.KFaR
69	130183.31	742606.13	56.498	-6.38597	32	Sand, shelly	7	Sparse conspicuous fauna	7	Circalittoral gravel and sand	CGS	3	CGS
69.2	130202.22	742675.92	56.4986	-6.38573	32	Cobble, gravel and sand	4	Faunal crusts and turf	6	Faunal crusts or short turfs (wave exposed rock)	PomByC	17	ECR.Efa
70	130307.57	742488.78	56.497	-6.38383	45	Sand, shelly	7	Barren sand	9	Circalittoral gravel and sand	CGS	3	CGS
71	129379.58	742477.43	56.4964	-6.39885	20	Boulders, cobble and sand	3	Algal and faunal turf	4	Kelp with fauna, foliose reds and coralline crusts	FoR	6	EIR.KFaR
72	129610.38	742369.31	56.4955	-6.395	20	Gravel and sand	5	Barren gravel	8	Circalittoral gravel and sand with epifauna	CGS	3	CGS
73	129780.28	742161.5	56.4938	-6.39203	27	Sand, shelly	7	Sparse conspicuous fauna	7	Circalittoral gravel and sand	CGS	3	CGS
74	129898.69	742066.5	56.493	-6.39002	23	Sand, shelly	7	Sparse conspicuous fauna	7	Circalittoral gravel and sand with epifauna	CGS	3	CGS
75	128330.25	742803.2	56.4987	-6.41618	8	Sand, shelly	7	Barren sand	9	Infralittoral gravel and sand	IGS	8	IGS
75.2	128348.09	742904.76	56.4996	-6.416	8	Maerl	6	Maerl	10	Marl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
76	128221.29	742661.74	56.4974	-6.4178	7	Sand, medium fine	8	Seagrass	11	Seagrass beds (sublittoral/lower shore)	Zmar	19	IMS.Sgr

Record	East OSGB	North OSGB	Lat WGS84	Long WGS84	Depth (m)	Habitat (sediment type)	Habitat no	Life form broad	Life form no	Biotope complex	Biotope code '97	Bio-tope no	Higher code
77	128300.97	742412.79	56.4952	-6.41625	10	Maerl	6	Maerl	10	Marl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
78	128282.77	742257.67	56.4938	-6.41638	10	Gravel and sand	5	Kelp forest (mixed) and ephemeral seaweeds	2	Sand affected, disturbed kelp and seaweeds	Lsac	15	SIR.K
79	128409.55	742180.96	56.4932	-6.41425	15	Maerl	6	Maerl	10	Marl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
80	128485.5	742001.24	56.4916	-6.41283	17	Bedrock, boulders, cobble and sand	2	Kelp park	3	kelp with red seaweeds (moderately exposed rock)	Lhyp.Pk	11	MIR.KR
81	128610	743196	56.5024	-6.41206	4	Sand, medium fine	8	Seagrass	11	Seagrass beds (sublittoral/lower shore)	Zmar	19	IMS.Sgr
82	128517	743141	56.5018	-6.4135	5	Sand, shelly	7	Ephemeral algae	12	Infralittoral gravel and sand	IGS	20	IGS
83	128708	743392	56.5042	-6.41068	4	Maerl	6	Maerl	10	Maerl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
84	128778	743364	56.504	-6.40951	4	Maerl	6	Maerl	10	Maerl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
85	128910	743463	56.5049	-6.40747	4	Maerl	6	Maerl	10	Maerl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
86	129001	743626	56.5065	-6.40618	5	Maerl	6	Maerl	10	Maerl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
87	129053	743738	56.5075	-6.40546	9	Maerl	6	Maerl	10	Maerl beds (open coast/clean sediment)	Phy	9	IGS.Mrl

Record	East OSGB	North OSGB	Lat WGS84	Long WGS84	Depth (m)	Habitat (sediment type)	Habitat no	Life form broad	Life form no	Biotope complex	Biotope code '97	Bio-tope no	Higher code
88	129150	743743	56.5076	-6.40389	12	Maerl	6	Maerl	10	Maerl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
89	129194	743646	56.5067	-6.40308	8	Maerl	6	Maerl	10	Maerl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
90	129258	743545	56.5059	-6.40192	4	Gravel and sand	5	Ephemeral algae	12	Infralittoral gravel and sand	IGS	20	IGS
91	129399	743485	56.5054	-6.39959	2	Sand, medium fine	8	Barren sand	8	Infralittoral gravel and sand	IGS	20	IGS
92	129427	743450	56.5051	-6.39909	4	Sand, shelly	7	Ephemeral algae	12	Infralittoral gravel and sand	IGS	20	IGS
93	129672	743490	56.5056	-6.39516	6	Maerl	6	Maerl	10	Maerl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
94	129615	743342	56.5043	-6.39594	5	Maerl	6	Maerl	10	Maerl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
95	129327	743317	56.5039	-6.40058	5	Maerl	6	Maerl	10	Maerl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
96	129137	743117	56.502	-6.40344	3	Maerl	6	Maerl	10	Maerl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
97	129100	743050	56.5014	-6.40398	4	Maerl	6	Maerl	10	Maerl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
98	128831	742872	56.4996	-6.40814	3	Sand, shelly	7	Ephemeral algae	12	Infralittoral gravel and sand	IGS	20	IGS



Record	East OSGB	North OSGB	Lat WGS84	Long WGS84	Depth (m)	Habitat (sediment type)	Habitat no	Life form broad	Life form no	Biotope complex	Biotope code '97	Bio-tope no	Higher code
99	128605	742678	56.4977	-6.41161	3	Bedrock and boulder	1	Kelp forest (mixed) and ephemeral seaweeds	2	Kelp with red seaweeds (moderately exposed rock)	LhyLsac.Ft	16	SIR.K
100	128522	742666	56.4976	-6.41293	8	Maerl	6	Maerl	10	Maerl beds (open coast/clean sediment)	Phy	9	IGS.Mrl
101	128173	742588	56.4967	-6.4185	3	Sand, medium fine	8	Seagrass	11	Seagrass beds (sublittoral/lower shore)	Zmar	19	IMS.Sgr
102	128500	743035	56.5009	-6.41368	4	Bedrock and boulder	1	Kelp forest (mixed) and ephemeral seaweeds	2	Kelp with red seaweeds (moderately exposed rock)	LhyLsac.Ft	16	SIR.K
103	128604	743234	56.5027	-6.4122	4	Bedrock and boulder	1	Kelp forest (mixed) and ephemeral seaweeds	2	Kelp with red seaweeds (moderately exposed rock)	LhyLsac.Ft	16	SIR.K
104	128658	743427	56.5045	-6.41152	4	Bedrock and boulder	1	Kelp forest (mixed) and ephemeral seaweeds	2	Kelp with red seaweeds (moderately exposed rock)	LhyLsac.Ft	16	SIR.K
105	129573	743399	56.5048	-6.39668	4	Bedrock and boulder	1	Kelp forest (mixed) and ephemeral seaweeds	2	Kelp with red seaweeds (moderately exposed rock)	LhyLsac.Ft	16	SIR.K
106	129365	743324	56.504	-6.39996	4	Bedrock and boulder	1	Kelp forest (mixed) and ephemeral seaweeds	2	Kelp with red seaweeds (moderately exposed rock)	LhyLsac.Ft	16	SIR.K
107	129244	743214	56.5029	-6.40181	4	Bedrock and boulder	1	Kelp forest (mixed) and ephemeral seaweeds	2	Kelp with red seaweeds (moderately exposed rock)	LhyLsac.Ft	16	SIR.K
108	128784	742807	56.499	-6.40884	4	Bedrock and boulder	1	Kelp forest (mixed) and ephemeral seaweeds	2	Kelp with red seaweeds (moderately exposed rock)	LhyLsac.Ft	16	SIR.K

Record	East OSGB	North OSGB	Lat WGS84	Long WGS84	Depth (m)	Habitat (sediment type)	Habitat no	Life form broad	Life form no	Biotope complex	Biotope code '97	Bio-tope no	Higher code
109	128637	742686	56.4978	-6.41108	4	Bedrock and boulder	1	Kelp forest (mixed) and ephemeral seaweeds	2	Kelp with red seaweeds (moderately exposed rock)	LhyLsac.Ft	16	SIR.K
110	128594	743315	56.5034	-6.41244	4	Sand, shelly	7	Barren sand	9	Infralittoral gravel and sand	IGS	20	IGS

## Appendix 2 - Photograph log from Intertidal Survey, Treshnish Isles Biotope Mapping Survey, August 2003

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
11/08/2003	IMTD	N/A	N/A	103	N	N/A	N/A	General view of Lunga and other islands from the south
11/08/2003	IMTD	N/A	N/A	102	N	N/A	N/A	General view of north Treshnish Isles from the south
11/08/2003	IMTD	N/A	N/A	101	N	N/A	N/A	View of Dutchmans Cap and Isles from the south
11/08/2003	Team 1 PAC	I	1	1604	008	1	30796 44996	Cairn na Burgh Beg; high to low water down transect 1
11/08/2003	Team 1 PAC	I	1	1605	008	1	30796 44996	Cairn na Burgh Beg; shot of Polygon 1 species, transect 1
11/08/2003	Team 1 PAC	I	2	1606	008	2	30796 44996	Cairn na Burgh Beg; shot of <i>Pelvetia</i> and <i>V. maura</i> zone, transect 1
11/08/2003	Team 1 PAC	I	2	1607	266	3	30790 45038	Cairn na Burgh Beg; enteromorpha rock pool, transect 1
11/08/2003	Team 1 PAC	I	3	1608	008	4	30791 45046	Cairn na Burgh Beg; shot of <i>Semibalanus balanoides</i> in polygon 3, transect 1
11/08/2003	Team 1 PAC	I	3	1609	110	4	30791 45046	Cairn na Burgh Beg; view along shore to east from transect 1
11/08/2003	Team 1 PAC	I	3	1610	278	4	30791 45046	Cairn na Burgh Beg; view along shore to west from transect 1
11/08/2003	Team 1 PAC	I	4	1611	054	5	30793 45054	Cairn na Burgh Beg; view of <i>F. ves/spi</i> , transect 1
11/08/2003	Team 1 PAC	I	4	1612	054	6		Cairn na Burgh Beg; close up of <i>Fucus ves/spi</i> , transect 1
11/08/2003	Team 1 PAC	I	4	1613	054	6	30797 45058	Cairn na Burgh Beg; close up of <i>Fucus ves/spi</i> , transect 1
11/08/2003	Team 1 PAC	I	4	1614	278	6	30797 45053	Cairn na Burgh Beg; furoid rock pool, transect 1
11/08/2003	Team 1 PAC	I	4/5	1615	008	7	30808 45031	Cairn na Burgh Beg; furoid polygon below water, transect 1
11/08/2003	Team 1 PAC	I	4/5	1616	110	7	30808 45031	Cairn na Burgh Beg; furoid polygon below water, transect 1
11/08/2003	Team 1 PAC	I	Hill	1617	300	8	30856 45015	Cairn na Burgh Beg; on top of hill looking down on transect 1 area
11/08/2003	Team 1 PAC	I	Hill	1618	340	Near 8	30588 45012	Cairn na Burgh Beg; on top of hill looking north down to shore
11/08/2003	Team 1 PAC	I	Hill	1619	050	Near 8	30855 45012	Cairn na Burgh Beg; on top of hill looking down and to east
11/08/2003	Team 1 PAC	I	Hill	1620	045	9	30893 45013	Cairn na Burgh Beg; on top of hill down to shore
11/08/2003	Team 1 PAC	I	Hill	1621	058	10	30908 45024	Cairn na Burgh Beg; on top of hill northeast down to shore on east side of island
11/08/2003	Team 1 PAC	I	Hill	1622	140	10	30908 45024	Cairn na Burgh Beg; on top of hill looking southeast down east side of island
11/08/2003	Team 1 PAC	I	Hill	1623	140	10	30908 45024	Cairn na Burgh Beg; on top of hill looking southeast down east side of island

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
11/08/2003	Team 1 PAC	I	Hill	1624	102	11	30929 44974	Cairn na Burgh Beg; on top of hill showing shore out to east
11/08/2003	Team 1 PAC	I		1625	176	11	30929 44974	Cairn na Burgh Beg; shore looking south from wpt 11
11/08/2003	Team 1 PAC	I		1626	176	11	30929 44974	Cairn na Burgh Beg; shore looking south from wpt 11
11/08/2003	Team 1 PAC	I		1627	164	12	30891 44937	Cairn na Burgh Beg; top of hill: looking south from end of wall
11/08/2003	Team 1 PAC	I	7	1628	352	14	30917 44895	T Cairn na Burgh Beg; top of shore on southeast corner of island (transect 2)-view north over barren cobbles and boulders to supralittoral
11/08/2003	Team 1 PAC	I	7	1629	104	14	30917 44895	Cairn na Burgh Beg; view down-shore along transect 2, across barren cobbles and boulders, the black lichen and barnacle zone to barnacle and limpet zone in background
11/08/2003	Team 1 PAC	I		1630	106		30937 44901	Cairn na Burgh Beg; enteromorpha pool within <i>V. maura</i> zone, polygon 2, transect 2
11/08/2003	Team 1 PAC	I	3	1631	062	17		Cairn na Burgh Beg; polygon 3 <i>Semibalanus balanoides</i> and limpets on transect 2
11/08/2003	Team 1 PAC	I	3	1632	000		30940 44889	Cairn na Burgh Beg; shot of yellow lichens on southeast-facing cliff
11/08/2003	Team 1 PAC	I	4	1633	034	19	30963 44895	Cairn na Burgh Beg; view north up east side of island, over barnacle-dominated shore (mixture of <i>BPat.Sem</i> and <i>FvesB</i> biotopes)
11/08/2003	Team 1 PAC	I	4	1634	245	19		Cairn na Burgh Beg; shot up beach of zonation (didn't come out well)
11/08/2003	Team 2 JPH	I		19	008	1	31616 44963	Cairn na Burgh More; view down transect 1 from top of shore
11/08/2003	Team 2 JPH	I	1/2	20	182	2	30584 44992	Cairn na Burgh More; yellow and grey lichens at top of shore, transect 1
11/08/2003	Team 2 JPH	I	2	21	182	2	30584 44992	Cairn na Burgh More; yellow and grey lichens on cliff shore backing
11/08/2003	Team 2 JPH	I	2	22	008	2	30584 44992	Cairn na Burgh More; down transect 1 polygon 2
11/08/2003	Team 2 ADC	I	2	23	080	2	30584 44992	Cairn na Burgh More; polygon 2 sub biotope, green rock pools
11/08/2003	Team 2 ADC	I	4	24	329	4	30588 45003	Cairn na Burgh More; polygon 4 ID
11/08/2003	Team 2 ADC	I	4	25	358	4	30588 45003	Cairn na Burgh More; rock pool in polygon 4
11/08/2003	Team 2 ADC	I	4	26	315	4	30588 45003	Cairn na Burgh More; rock pool in polygon 4
11/08/2003	Team 2 ADC	I	5	27	054	5	30588 45030	Cairn na Burgh More; view of polygon 5 from top
11/08/2003	Team 2 ADC	I	5	28	334	5	30588 45030	Cairn na Burgh More; view of polygon 5 from top

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
11/08/2003	Team 2 ADC	I	5	29	268	5	30588 45030	Cairn na Burgh More; <i>F.ver/spir</i> in polygon 5
11/08/2003	Team 2 ADC	I	6	30	288	6	30573 45045	Cairn na Burgh More; <i>Laminaria</i> polygon 6
11/08/2003	Team 2 ADC	I	6	31	030	6	30573 45045	Cairn na Burgh More; <i>Laminaria</i> polygon 6
11/08/2003	Team 2 ADC	I	6	32	069	6	30573 45045	Cairn na Burgh More; <i>Laminaria</i> polygon 6
11/08/2003	Team 2 ADC	I		33	001			Cairn na Burgh More; view from top of island along transect 2
11/08/2003	Team 2 ADC	I		34	011			Cairn na Burgh More; view from top of island along transect 2
11/08/2003	Team 2 ADC	I		35	036			Cairn na Burgh More; view from top of island along transect 2
11/08/2003	Team 2 ADC	I		36	328			Cairn na Burgh More; view from top of island along transect 2
11/08/2003	Team 2 ADC	I		37	310			Cairn na Burgh More; view from top of island along transect 2
11/08/2003	Team 2 ADC	I		38	302			Cairn na Burgh More; view from top of island along transect 2
11/08/2003	Team 2 ADC	I		39	238	7		Cairn na Burgh More; view of Treshnish Isles from top of Island
11/08/2003	Team 2 ADC	I		40	317	7		Cairn na Burgh More; view down northern edge
11/08/2003	Team 2 ADC	I		41	281	7		Cairn na Burgh More; view down northern edge
11/08/2003	Team 2 ADC	I		42	266	7		Cairn na Burgh More; view down northern edge
11/08/2003	Team 2 ADC	I		43	233	7		Cairn na Burgh More; view down northern edge
11/08/2003	Team 2 ADC	I		44	222	7		Cairn na Burgh More; view down northern edge
11/08/2003	Team 2 ADC	I		45	245			Cairn na Burgh More; down gully on west side
11/08/2003	Team 2 ADC	I		46	350			Cairn na Burgh More; view along transect 1 from top
11/08/2003	Team 2 ADC	I		47	025	8		View NE across shore to Cairn na Burgh Beg from top of cliff, NE corner of Cairn na Burgh More
11/08/2003	Team 2 ADC	I		48	046	8		Cairn na Burgh More; view from NE corner of island across channel to Cairn na Burgh Beg
11/08/2003	Team 2 ADC	I		49	074	8		Cairn na Burgh More; view from NE corner of island across channel to Cairn na Burgh Beg
11/08/2003	Team 2 ADC	I		50	111	8		View from NE corner of Cairn na Burgh More, looking SE across channel to Cairn na Burgh Beg

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
11/08/2003	Team 2 JPH	I		51	132	8		Cairn na Burgh More; view of shore to SE from wpt 8, and to islet between Beg and More
11/08/2003	Team 2 ADC	I		52	150			View to south over shore down east side of Cairn na Burgh More
11/08/2003	Team 2 ADC	I		53	172	9		Cairn na Burgh More; view to shore from wpt 9 (South)
11/08/2003	Team 2 ADC	I		54	194	9		Cairn na Burgh More; view to shore from wpt 9
11/08/2003	Team 2 ADC	I		55	217	9		Cairn na Burgh More; view to shore from wpt 9
11/08/2003	Team 2 ADC	I		56	244	9		Cairn na Burgh More; view to shore from wpt 9
11/08/2003	Team 2 ADC	I		57	278	9		Cairn na Burgh More; view to shore from wpt 9
11/08/2003	Team 2 ADC	I		58	221	9		Cairn na Burgh More; close up of boulders and rock pools
11/08/2003	Team 2 ADC	I		59	285			Cairn na Burgh More; west side of island
11/08/2003	Team 2 ADC	I	13	60	098	11		Cairn na Burgh More; edge of <i>A. nodosum</i> , east shore
11/08/2003	Team 2 ADC	I	13	61	156	11		Cairn na Burgh More; edge of <i>A. nodosum</i> , east shore
11/08/2003	Team 2 ADC	I	14	62	109	12		Cairn na Burgh More; end of <i>A. nodosum</i> into <i>F. serr</i> , <i>Himantalia</i> zone
11/08/2003	Team 2 ADC	I	15	63	182	13		Cairn na Burgh More; wpt 13
11/08/2003	Team 2 ADC	I	16	64	129	14		Cairn na Burgh More; Edge of wpt 14
11/08/2003	Team 2 ADC	I	16	65	211	14		Cairn na Burgh More; Close up of polygon 16
11/08/2003	Team 2 ADC	I	17	66	113	15		Cairn na Burgh More; edge of polygon 17/wpt 15
11/08/2003	Team 2 ADC	I	18	67	276	16		Cairn na Burgh More; up shore from wpt 16 YG biotope
11/08/2003	Team 2 ADC	I		68				Cairn na Burgh More; shot of stack on the south side of the Island
11/08/2003	Team 2 ADC	I		69	052			Cairn na Burgh More; landscape from boat of west side
11/08/2003	Team 2 ADC	I		70	100			Cairn na Burgh More; landscape from boat of west side
11/08/2003	Team 2 ADC	I		71	064			Cairn na Burgh More; landscape from boat of west side
12/08/2003	Team 1 PAC		3/4	1635	314	1	30048 43711	Fladda; from bottom of shore boundary between 3/4 looking up shore
12/08/2003	Team 1 PAC		3/4	1636	150	1	30048 43711	Fladda; shot of species at polygon 3/4 boundary
12/08/2003	Team 1 PAC		3	1637			30048 43731	Fladda; polygon 3 species

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
12/08/2003	Team 1 PAC		4	1638				Fladda; polygon 4 species
12/08/2003	Team 1 PAC		3	1639	314			Fladda; polygon 3 species crevice
12/08/2003	Team 1 PAC		3	1640	314		30039 43731	Fladda; polygon 3 species rock pool
12/08/2003	Team 1 PAC		2	1641	314	2	30039 43731	Fladda; polygon 2 species
12/08/2003	Team 1 PAC		4	1642		near 1		Fladda; polygon 4 species - <i>F. serr</i> , <i>Mastocarpus</i> , <i>Alaria</i> , <i>L. dig</i>
12/08/2003	Team 1 PAC		4	1643		near 1		Fladda; polygon 4 - <i>Osmundea pinnatifida</i> and <i>Mastocarpus</i>
12/08/2003	Team 1 PAC		4	1644		near 1		Fladda; polygon 4 - <i>Mastocarpus</i> and <i>Alaria</i>
12/08/2003	Team 1 PAC		3	1645				Fladda; polygon 3 species - Barnacles, <i>Chthamalus</i>
12/08/2003	Team 1 PAC		3	1646				Fladda; polygon 3 species - Barnacles, <i>Chthamalus</i>
12/08/2003	Team 1 PAC		2	1647				Fladda; polygon 2 - <i>Pelvetia</i>
12/08/2003	Team 1 PAC		2	1648				Fladda; polygon 2 - <i>F. spi</i>
12/08/2003	Team 1 PAC		2	1649	052			Fladda; view to east along shore
12/08/2003	Team 1 PAC		1	1650	052			Fladda; view of YG polygon 1 looking east
12/08/2003	Team 1 PAC			1651	096			Fladda; view of outcrop toward wpt 5 on end of finger
12/08/2003	Team 1 PAC			1652	096			Fladda; view of outcrop toward wpt 5 on end of finger
12/08/2003	Team 1 PAC		5	1653				Fladda; species on outcrop - Him and <i>F. serr</i>
12/08/2003	Team 1 PAC			1654	080			Fladda; cliffs to shore from outcrop showing zonation
12/08/2003	Team 1 PAC			1655	080			Fladda; cliffs to shore from outcrop showing zonation
12/08/2003	Team 1 PAC			1656	150	6		Fladda; photo from cliff showing the two outcrops
12/08/2003	Team 1 PAC			1657	192	6		Photo from cliff showing team 2 start area of the gully
12/08/2003	Team 1 PAC			1658	146	7		Photo from cliff showing the outcrop and the area to the east of the outcrop
12/08/2003	Team 1 PAC			1659	070	7		Photo from cliff along shore to east of outcrop
12/08/2003	Team 1 PAC			1660	198	8		Fladda; photo from cliff back up shore
12/08/2003	Team 1 PAC			1661	014	8		Fladda; photo from cliff down the shore

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
12/08/2003	Team 1 PAC			1662	152	9		Fladda; photo from cliff up the shore
12/08/2003	Team 1 PAC			1663	284	10		Fladda; photo from cliff of bay area on north of island
12/08/2003	Team 1 PAC			1664	134	11		Fladda; photo from cliff back into the bay from the other side
12/08/2003	Team 1 PAC			1665	318	12		Fladda; photo from cliffs showing <i>BPat, V.maura/ YG zonation</i>
12/08/2003	Team 1 PAC		1	1666			29863 44359	Fladda; close up of YG
12/08/2003	Team 1 PAC		1	1667			29863 44359	Fladda; close up of YG
12/08/2003	Team 1 PAC		1	1668	200	13	29844 44353	Fladda; shot along island of cliffs
12/08/2003	Team 1 PAC		1	1669	322	13	29844 44353	Fladda; island off north point - a lot of Ent
12/08/2003	Team 1 PAC		1	1670	228	13	29844 44353	Fladda; second island off north point - usual polygons
12/08/2003	Team 1 PAC			1671	270	14		Fladda; photo around north point of island moving around to the west towards south to show extent of YG on cliff tops (4 photos should join up)
12/08/2003	Team 1 PAC			1672	270	14		Fladda; photo around north point of island moving around to the west towards south to show extent of YG on cliff tops (4 photos should join up)
12/08/2003	Team 1 PAC			1673	270	14		Fladda; photo around north point of island moving around to the west towards south to show extent of YG on cliff tops (4 photos should join up)
12/08/2003	Team 1 PAC			1674	200	14		Fladda; photo around north point of island moving around to the west towards south to show extent of YG on cliff tops (4 photos should join up)
12/08/2003	Team 1 PAC			1675	196	15	29815 44198	Fladda; photo of shingle bay from cliffs
12/08/2003	Team 1 PAC			1676	016	15		Fladda; photo of cliffs up to the north of the island
12/08/2003	Team 1 PAC			1677	270			Fladda; <i>enteromorpha</i> on boulder beach at mouth of gully
12/08/2003	Team 1 PAC			1678	240			Fladda; shots into bay from north side from entrance to head of bay mouth
12/08/2003	Team 1 PAC			1679	220			Fladda; shots into bay from north side from entrance to head of bay mouth
12/08/2003	Team 1 PAC			1680	200			Fladda; shots into bay from north side from entrance to head of bay mouth
12/08/2003	Team 1 PAC			1681				Fladda; JH and AC trekking through growth
12/08/2003	Team 1 PAC			1682				Fladda; JH and AC trekking through growth



Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
12/08/2003	Team 1 PAC			1683				Relaxing on the boat after a hard days mapping
12/08/2003	Team 1 PAC			1684				Colin looking thoughtful
12/08/2003	Team 2 ANC	G2		72	124	1	29924 43725	Fladda; taken from wpt 1 overview of east shore
12/08/2003	Team 2 ANC	G2		73	142	1	29924 43725	Fladda; taken from wpt 1 overview of east shore
12/08/2003	Team 2 ANC	G2		74	164	1	29924 43725	Fladda; taken from wpt 1 overview of east shore
12/08/2003	Team 2 ANC	G2		75	193	1	29924 43725	Taken from wpt 1 overview of east shore
12/08/2003	Team 2 ANC	G2		76	224	1	29924 43725	Fladda; taken from wpt 1 overview of east shore
12/08/2003	Team 2 ANC	G2	1	77	143	2	30012 43727	Fladda; guano-covered rocks (cormorants). Target note 1 (30007 43716 noted in field notes, though this photo is tagged to wpt 2 very close by)
12/08/2003	Team 2 ANC	G2	1	78	141	2	30012 43727	Fladda; guano-covered rocks (cormorants). Target note 1 (30007 43716 noted in field notes, though this photo is tagged to wpt 2 very close by)
12/08/2003	Team 2 ANC	G2	1	79	229	-	30027 43700	Fladda; lichina close up
12/08/2003	Team 2 ANC	G2	1	80	349	3	30016 43667	Fladda; view to land from wpt 1 polygon 1
12/08/2003	Team 2 ANC	G2	1	81	144	3	30016 43667	Fladda; view to sea from wpt 1 polygon 1
12/08/2003	Team 2 ANC	G2	1	82	003	3	30015 43664	Fladda; rock pools in polygon 1
12/08/2003	Team 2 ANC	G2	1	83	169	3	30017 43655	Fladda; lichens in polygon 1
12/08/2003	Team 2 ANC	G2		84	255		30011 43651	Fladda; target note 2. Zonation on rock face
12/08/2003	Team 2 ANC	G2		85	246		30007 43685	Fladda; lower shore <i>F. ves B</i>
12/08/2003	Team 2 ANC	G2		86	286		30007 43685	Fladda; ent covered rocks up shore. Target note 3
12/08/2003	Team 2 ANC	G2	3	87	159	4	29995 43688	Fladda; <i>pelvetia</i> polygon ID
12/08/2003	Team 2 ANC	G2		88	090	6	29974 43676	Fladda; <i>F. spi</i> and <i>Porphyra</i>
12/08/2003	Team 2 ANC	G2		89	184		29972 43672	Fladda; <i>Alaria</i> in surge gully
12/08/2003	Team 2 ANC	G2		90	298	8	29989 43624	Fladda; large enteromorpha-covered pool
12/08/2003	Team 2 ANC	G2		91	265	8	28897 43629	Fladda; large enteromorpha- covered pool
12/08/2003	Team 2 ANC	G2		92	079		29996 43656	Fladda; zonation and alaria on vertical walls

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
12/08/2003	Team 2 ANC	G2	8/9	93	226	9	29957 43617	Fladda; overview of large inlets filled with <i>L. dig</i>
12/08/2003	Team 2 ANC	G2	8/9	94	255	9	29957 43617	Fladda; overview of large inlets filled with <i>L. dig</i>
12/08/2003	Team 2 ANC	G2	8/9	95	293	9	29957 43617	Fladda; overview of large inlets filled with <i>L. dig</i>
12/08/2003	Team 2 ANC	G2		96	237		29957 43617	Fladda; "white" barnacle layer above <i>S. balanoides</i>
12/08/2003	Team 2 ANC	G2		97	138		29855 43691	Fladda; view of east shore from top
12/08/2003	Team 2 ANC	G2		98	162		29855 43691	Fladda; view of east shore, zonation on rocks
12/08/2003	Team 2 ANC	G2		99	279	11	29760 43645	Fladda; view of inlet on southern east side
12/08/2003	Team 2 ANC	G2		100	301	11	29760 43645	Fladda; view of inlet on southern east side
12/08/2003	Team 2 ANC	G2		101	337	11	29760 43645	Fladda; view of inlet on southern east side
12/08/2003	Team 2 ANC	G2		102	194	12	29679 43744	Fladda; view down shore from top of inlet
12/08/2003	Team 2 ANC	G2		103	245	13	29691 43693	Fladda; stream through shore inlet
12/08/2003	Team 2 ANC	G2	11/12	104	139	14	29667 43707	Fladda; target note 5 <i>F. cer.</i> , <i>F. spi</i>
12/08/2003	Team 2 ANC	G2		105	086	15	29543 43483	Fladda; view from top of cliff at south to inlet/bay
12/08/2003	Team 2 ANC	G2		106	321		29480 43527	Fladda; view from top of cliff, south
12/08/2003	Team 2 ANC	G2		107	249		29480 43527	Fladda; VIEW from top of cliff, enteromorpha-covered boulders
12/08/2003	Team 2 ANC	G2		108	217		29501 43618	Fladda; zonation down cliff with Ben surveying
12/08/2003	Team 2 ANC	G2		109	013		29520 43685	Fladda; cliff wall, Lichens, west of island
12/08/2003	Team 2 ANC	G2		110	249		29568 43795	Fladda; shore, Treshnish islands to south
12/08/2003	Team 2 ANC	G2		111	329		29561 43965	Fladda; <i>BPat</i> into Alaria, <i>L. dig</i> on west shore
12/08/2003	Team 2 ANC	G2		112	041	16	29645 44000	Fladda; Wpt 16 north
12/08/2003	Team 2 ANC	G2		113	038		29698 43914	Fladda; view from mouth of inlet to west side, north shore
12/08/2003	Team 2 ANC	G2		114	061		29698 43914	Fladda; view from mouth of inlet to west side, north shore
12/08/2003	Team 2 ANC	G2		115	183		29695 43917	Fladda; view of mouth of bay
12/08/2003	Team 2 ANC	G2		116	011	17	29700 43847	Fladda; view from top of island out to west

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
12/08/2003	Team 2 ANC	G2		117	011	17	29700 43847	Fladda; view from top of island out to west
12/08/2003	Team 2 ANC	G2		118	130	18	29691 43914	Fladda; arenicola casts
13/08/2003	Team 1 PAC	C		1685	134			Sgeir a' Chaisteil; photo 1/3 down transect 1
13/08/2003	Team 1 PAC	C	1	1686	134	1		Sgeir a' Chaisteil; top of transect 1
13/08/2003	Team 1 PAC	C	1	1687				Sgeir a' Chaisteil; boulder in YG zone
13/08/2003	Team 1 PAC	C	1	1688	082			Sgeir a' Chaisteil; YG area with Enteromorpha rock pool
13/08/2003	Team 1 PAC	C	2	1689		2		Sgeir a' Chaisteil; <i>pelvetia</i> and <i>F. spi</i>
13/08/2003	Team 1 PAC	C	2	1690		2		Sgeir a' Chaisteil; <i>pelvetia</i> and <i>F. spi</i>
13/08/2003	Team 1 PAC	C	2	1691				Sgeir a' Chaisteil; general large rock pool
13/08/2003	Team 1 PAC	C	2	1692				Sgeir a' Chaisteil; close up of species in rock pool
13/08/2003	Team 1 PAC	C	2	1693				Sgeir a' Chaisteil; close up of species in rock pool
13/08/2003	Team 1 PAC	C	3	1694			27869 42707	Sgeir a' Chaisteil; close up of mixed fucoids
13/08/2003	Team 1 PAC	C	3	1695			27869 42707	Sgeir a' Chaisteil; close up of mixed fucoids and <i>Ascophyllum</i>
13/08/2003	Team 1 PAC	C	3	1696			27869 42707	Sgeir a' Chaisteil; close up of mixed fucoids and <i>Ascophyllum</i>
13/08/2003	Team 1 PAC	C	3	1697	066		27868 42710	Sgeir a' Chaisteil; photos up and down shore
13/08/2003	Team 1 PAC	C	3	1698	224		27868 42710	Sgeir a' Chaisteil; photos up and down shore
13/08/2003	Team 1 PAC	C		1699	066			Sgeir a' Chaisteil; 2 largish islands at east end of channel
13/08/2003	Team 1 PAC	C		1700	124			Sgeir a' Chaisteil; small island and rocks in channel
13/08/2003	Team 1 PAC	C		1701	120		27867 42701	Sgeir a' Chaisteil; small island and rocks in channel
13/08/2003	Team 1 PAC	C	3/4	1702	302	4		Sgeir a' Chaisteil; photo back up transect from water
13/08/2003	Team 1 PAC	C		1703	084	near 5		Sgeir a' Chaisteil; photo down the channel from top of cliff
13/08/2003	Team 1 PAC	C	5	1704	216	5	27823 42677	Sgeir a' Chaisteil; photo up shore to top of channel from top of cliff
13/08/2003	Team 1 PAC	C		1705				Sgeir a' Chaisteil; kelp zone
13/08/2003	Team 1 PAC	C	7	1706				Sgeir a' Chaisteil; enteromorpha boulders

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13/08/2003	Team 1 PAC	C	7	1707				Sgeir a' Chaisteil; enteromorpha boulders
13/08/2003	Team 1 PAC	C		1708	260			Sgeir a' Chaisteil; alaria pool/gully (FK rock pool)
13/08/2003	Team 1 PAC	C	8	1709	260		27764 42663	Sgeir a' Chaisteil; boulder area with Ent, near pool
13/08/2003	Team 1 PAC	C		1710	260		27764 42663	Sgeir a' Chaisteil; alaria pool/gully (FK rock pool)
13/08/2003	Team 1 PAC	C		1711	222			Sgeir a' Chaisteil; kelp spit at south west tip
13/08/2003	Team 1 PAC	C	9	1712	286			Sgeir a' Chaisteil; <i>S. balanoides</i> plateau at south west tip
13/08/2003	Team 1 PAC	C	9	1713				Sgeir a' Chaisteil; <i>Mytilus</i> and <i>S. balanoides</i> on plateau
13/08/2003	Team 1 PAC	C	9	1714				Sgeir a' Chaisteil; <i>Nucella</i> on rock (super abundant)
13/08/2003	Team 1 PAC	C		1715	190		27713 42708	Sgeir a' Chaisteil; kelp area south west tip
13/08/2003	Team 1 PAC	C	9	1716	120	7		Sgeir a' Chaisteil; from end of polygon 9 towards cliff
13/08/2003	Team 1 PAC	C	9	1717	040	7		Sgeir a' Chaisteil; down shore within polygon 9
13/08/2003	Team 1 PAC	C	9	1718	040	7		Sgeir a' Chaisteil; down shore within polygon 9 and boulders in polygon 11
13/08/2003	Team 1 PAC	C	9	1719	220	7		Sgeir a' Chaisteil; view to Dutchmans Cap
13/08/2003	Team 1 PAC	C		1720	062		27829 42827	Sgeir a' Chaisteil; rock pool going and cliffs
13/08/2003	Team 1 PAC	C	13	1721	082		27834 42854	Sgeir a' Chaisteil; cliffs and exposed shore
13/08/2003	Team 1 PAC	C	14	1722	084		27866 42874	Sgeir a' Chaisteil; close up of <i>Porphyra</i> and <i>Pelvetia</i> (polygon 14)
13/08/2003	Team 1 PAC	C	14	1723	084		27866 42874	Sgeir a' Chaisteil; close up of <i>Lichina</i> (polygon 14)
13/08/2003	Team 1 PAC	C	14	1724	084		27866 42874	Sgeir a' Chaisteil; close up of <i>Porphyra</i> and <i>Pelvetia</i> (polygon 14)
13/08/2003	Team 1 PAC	C	13 (1)	1725			27918 42950	Sgeir a' Chaisteil; sub bio 1 in polygon 13
13/08/2003	Team 1 PAC	C	13 (1)	1726			27918 42950	Sgeir a' Chaisteil; close up of <i>Mytilus</i> and <i>Porphyra</i>
13/08/2003	Team 1 PAC	C		1727			27955 42967	Sgeir a' Chaisteil; area of <i>Porphyra</i> , <i>F. ves</i> , <i>Enteromorpha</i> , green pools and <i>S. balanoides</i>
13/08/2003	Team 1 PAC	C		1728			27955 42967	Sgeir a' Chaisteil; area of <i>Porphyra</i> , <i>F. ves</i> , <i>Enteromorpha</i> , green pools and <i>S. balanoides</i>
13/08/2003	Team 1 PAC	C	13 (1)	1729	136	10	near wpt 10	Sgeir a' Chaisteil; photo of cave from shore

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
13/08/2003	Team 1 PAC	C	13 (1)	1730	136	10		Sgeir a' Chaisteil; photo of cave from shore
13/08/2003	Team 1 PAC	C		1731	020	10		Sgeir a' Chaisteil; photo of biotopes on far side of cave entrance
13/08/2003	Team 1 PAC	C		1732	036	above 10		Sgeir a' Chaisteil; photo of shore on far side of cave taken from the cliff above the cave
13/08/2003	Team 1 PAC	C		1733	058	12		Sgeir a' Chaisteil; biotopes on shore to east taken from cliff top
13/08/2003	Team 1 PAC	C		1734	096	12		Sgeir a' Chaisteil; biotopes on shore to east taken from cliff top
13/08/2003	Team 1 PAC	C		1735	110	12		Sgeir a' Chaisteil; biotopes on shore to east taken from cliff top
13/08/2003	Team 1 PAC	C		1736	192	12		Sgeir a' Chaisteil; inlet on south side near channel
13/08/2003	Team 1 PAC	C		1737	192	12		Sgeir a' Chaisteil; inlet on south side near channel
13/08/2003	Team 1 PAC	C		1738		13		Sgeir a' Chaisteil; <i>prasiola</i> close up
13/08/2003	Team 1 PAC	C		1739		13		Sgeir a' Chaisteil; <i>prasiola</i> close up
13/08/2003	Team 1 PAC	C		1740		14		Sgeir a' Chaisteil; <i>ascophyllum</i> biotope and mixed fucoids
13/08/2003	Team 1 PAC	C		1741				Sgeir a' Chaisteil; <i>ascophyllum</i> biotope and mixed fucoids
13/08/2003	Team 2 ANC	E		119	139	1	28545 43371	Sgeir an Eirionnaich; landing point. View from top of shore
13/08/2003	Team 2 ANC	E	1	120	033	1	28545 43371	Sgeir an Eirionnaich; lichens on upper shore
13/08/2003	Team 2 ANC	E	2	121	199		28561 43368	Sgeir an Eirionnaich; pelvetia polygon ID with barnacles
13/08/2003	Team 2 ANC	E		122			28559 43367	Sgeir an Eirionnaich; barnacles within polygon ID 2
13/08/2003	Team 2 ANC	E		123			28559 43367	Sgeir an Eirionnaich; barnacles within polygon ID 2
13/08/2003	Team 2 ANC	E	3	124	152		28565 43366	Sgeir an Eirionnaich; <i>F. spi</i> polygon ID 3
13/08/2003	Team 2 ANC	E		125	239		28565 43366	Sgeir an Eirionnaich; <i>F. spi</i> polygon ID 3 close up
13/08/2003	Team 2 ANC	E	4	126	195		28569 43339	Sgeir an Eirionnaich; <i>Ascophyllum</i> polygon ID close up
13/08/2003	Team 2 ANC	E		127	200		28569 43339	Sgeir an Eirionnaich; across <i>Ascophyllum</i> zone on transect
13/08/2003	Team 2 ANC	E	5	128	125	2	28576 43349	Sgeir an Eirionnaich; <i>F. serr</i> polygon ID
13/08/2003	Team 2 ANC	E		129			28371 43349	Sgeir an Eirionnaich; off white slimy encrusting mass under boulder (eggs?)
13/08/2003	Team 2 ANC	E		130		3	28568 43344	Sgeir an Eirionnaich; under rock communities (target note 1)

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
13/08/2003	Team 2 ANC	E		131			28568 43344	Sgeir an Eirionnaich; sponge under rock/seaweed (target note 1)
13/08/2003	Team 2 ANC	E		132	197		28565 43340	Sgeir an Eirionnaich; low water facing south
13/08/2003	Team 2 ANC	E	4	133	168		28565 43340	Sgeir an Eirionnaich; <i>BPat</i> on vertical faces of rocks in polygon 4
13/08/2003	Team 2 ANC	E	6	134	197	4	28556 43313	Sgeir an Eirionnaich; <i>L. sac</i> on very bottom of shore
13/08/2003	Team 2 ANC	E	7	135		4	28556 43313	Sgeir an Eirionnaich; BPat polygon ID
13/08/2003	Team 2 ANC	E		136	060		28556 43313	Sgeir an Eirionnaich; zonation on Island. <i>Ascophyllum</i> to <i>F. serr</i> to <i>L. dig</i>
13/08/2003	Team 2 ANC	E		137	089		28556 43313	Sgeir an Eirionnaich; zonation on Island. <i>Ascophyllum</i> to <i>F. serr</i> to <i>L. dig</i>
13/08/2003	Team 2 ANC	E		138	111		28556 43313	Sgeir an Eirionnaich; zonation on Island. <i>Ascophyllum</i> to <i>F. serr</i> to <i>L. dig</i>
13/08/2003	Team 2 ANC	E	6	139	158		28523 43245	Sgeir an Eirionnaich; <i>L. dig</i> polygon ID close up
13/08/2003	Team 2 ANC	E		140			28523 43245	Sgeir an Eirionnaich; actinia in crevices/rocks
13/08/2003	Team 2 ANC	E		141	092		28494 43196	Sgeir an Eirionnaich; view of island (southern)
13/08/2003	Team 2 ANC	E		142	107		28494 43196	Sgeir an Eirionnaich; view of Island closer shot
13/08/2003	Team 2 ANC	E		143	230	6	28449 43116	Sgeir an Eirionnaich; southern tip of island into <i>L. dig</i> polygon
13/08/2003	Team 2 ANC	E		144	010		28447 43323	Sgeir an Eirionnaich; zonation on east side of island
13/08/2003	Team 2 ANC	E		145	275		28473 43374	Sgeir an Eirionnaich; gully/inlet on north west side
13/08/2003	Team 2 ANC	E	8	146	319	7	28484 43364	Sgeir an Eirionnaich; gully/inlet on north west side (target note 2)
13/08/2003	Team 2 ANC	E		147	311		28455 43425	Sgeir an Eirionnaich; lichina above barnacles on rocks in gully
13/08/2003	Team 2 ANC	E		148		8	28447 43433	Sgeir an Eirionnaich; mussels/ <i>Porphyra</i>
13/08/2003	Team 2 ANC	E		149		8	28447 43433	Sgeir an Eirionnaich; mussels/ <i>Porphyra</i>
13/08/2003	Team 2 ANC	E		150			28447 43433	Sgeir an Eirionnaich; <i>nucella</i>
13/08/2003	Team 2 ANC	E		151		8	28447 43433	Sgeir an Eirionnaich; <i>F. ves</i> with no bladders with <i>Palmaria</i>
13/08/2003	Team 2 ANC	E		152	111		28538 43523	Sgeir an Eirionnaich; channel on North side
13/08/2003	Team 2 ANC	E		153	076		28538 43523	Sgeir an Eirionnaich; island to north, over channel, zonation
13/08/2003	Team 2 ANC	E		154			28647 43483	Sgeir an Eirionnaich; rock pool, grazing limpets, north edge

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
13/08/2003	Team 2 ANC	E		155			28656 43510	Sgeir an Eirionnaich; out of focus
13/08/2003	Team 2 ANC	E		156			28656 43510	Sgeir an Eirionnaich; sponges on rocks
13/08/2003	Team 2 ANC	E		157	301			Sgeir an Eirionnaich; islands to north, not accessible by foot
13/08/2003	Team 2 ANC	E		158	014			Sgeir an Eirionnaich; islands to north, not accessible by foot
14/08/2003	Team 1 IMTD	B	1&2	1743	360	1	28021 42579	Lunga, northern half of east side; view along isthmus separating Lunga from Sgeir a Chaisteil
14/08/2003	Team 1 IMTD	B	1&2	1744	034	1	28021 42579	Lunga, northern half of east side; view of rocky platform with PeIB (with islands in view)
14/08/2003	Team 1 IMTD	B	1&2	1745	300	1	28021 42579	Lunga, northern half of east side; towards southern tip of northern promontory (Sgeir a Chaisteil) and channel
14/08/2003	Team 1 IMTD	B	2	1746			27987 42662	Lunga, northern half of east side; close up polygon 3, Porphyra and <i>S. balanoides</i>
14/08/2003	Team 1 IMTD	B	3	1747	300	3	27987 42662	Lunga, northern half of east side; <i>F. serr/ Ascophyllum</i> polygon
14/08/2003	Team 1 IMTD	B		1748	225	3	27987 42662	Lunga, northern half of east side; <i>F. serr</i> with <i>Ascophyllum</i> polygon, NW tip of Lunga
14/08/2003	Team 1 IMTD	B		1749	022	4	28037 42696	Lunga, northern half of east side; <i>L. dig</i> (4) and <i>F. serr</i> (3) at crossing point between Lunga and Sgeir a Chaisteil
14/08/2003	Team 1 IMTD	B		1750	c-up		28213 42260	Lunga, northern half of east side; <i>Lichina</i> in <i>PeIB</i> biotope
14/08/2003	Team 1 IMTD	B		1751	c-up		28213 42260	Lunga, northern half of east side; Chthamalus
14/08/2003	Team 1 IMTD	B		1752	c-up		28213 42260	Lunga, northern half of east side; Chthamalus
14/08/2003	Team 1 IMTD	B	9	1753	c-up	5	28810 42046	Lunga, northern half of east side; VerPor (polygon 9) patch in Ver biotope
14/08/2003	Team 1 IMTD	B	9	1754	c-up	6	28133 41948	Lunga, northern half of east side; Ver biotope
14/08/2003	Team 1 IMTD	B	9	1755	c-up	6	28133 41948	Lunga, northern half of east side; Ver biotope
14/08/2003	Team 1 IMTD	B	9	1756	c-up	6	28133 41948	Lunga, northern half of east side; YG on cliffs above Polygon 9 - yellows and Ramalina
14/08/2003	Team 1 IMTD	B	11	1757	142	7	28115 41922	Lunga, northern half of east side; <i>Ala L. dig</i> biotope by large gully (mouth)
14/08/2003	Team 1 IMTD	B	11	1758	142		28115 41922	Lunga, northern half of east side; <i>F. serr</i> , <i>Actinia</i> , <i>Enteromorpha</i> , <i>Osmundea pinnatifida</i> , <i>Mastocarpus</i>
14/08/2003	Team 1 IMTD	B	11	1759	142		28115 41922	Lunga, northern half of east side; <i>Alaria</i> , enc <i>coralline</i> alga, spirorbids in overhang

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
14/08/2003	Team 1 IMTD	B	7	1760	142		28115 41922	Lunga, northern half of east side; patella with <i>Enteromorpha</i> tassels and <i>S. balanoides</i>
14/08/2003	Team 1 IMTD	B	11	1761	142		28115 41922	Lunga, northern half of east side; <i>Mastocarpus</i> and <i>Halichondria</i>
14/08/2003	Team 1 IMTD	B	11	1762	142		28115 41922	Lunga, northern half of east side; <i>Laminaria</i> and furoid sporelings and <i>Halichondria</i>
14/08/2003	Team 1 IMTD	B	2B	1763	314	8	28092 41887	Lunga, northern half of east side; cave
14/08/2003	Team 1 IMTD	B	2B	1764	314	8	28092 41887	Lunga, northern half of east side; <i>EphX</i> in front of cave
14/08/2003	Team 1 IMTD	B	9	1765	014	9	28008 41801	Lunga, northern half of east side; sub biotopes in Ver (9)
14/08/2003	Team 1 IMTD	B		1766	014	9	28008 41801	Lunga, northern half of east side; Sub biotopes in Ver (9)
14/08/2003	Team 1 IMTD	B	9	1767	c-up	9	28008 41801	Lunga, northern half of east side; lichina and <i>L. ver</i>
14/08/2003	Team 1 IMTD	B	9	1768	c-up	9	28008 41801	Lunga, northern half of east side; <i>Porphyra</i> and <i>Chthamalus</i> / <i>S. balanoides</i>
14/08/2003	Team 1 IMTD	B	9	1769	c-up	9	28008 41801	Lunga, northern half of east side; <i>F. spir</i>
14/08/2003	Team 1 IMTD	B	9	1770	044		27984 41770	Lunga, northern half of east side; view along beach and north
14/08/2003	Team 1 IMTD	B	top of hill	1771	120	10		Lunga, northern half of east side; view of sharp gully from hill top
14/08/2003	Team 1 IMTD	B	top of hill	1772	150	10		Lunga, northern half of east side; view of grassy promontory from hill top
14/08/2003	Team 1 IMTD	B	top of hill	1773	190	10		Lunga, northern half of east side; view to landing place from hill top
14/08/2003	Team 1 IMTD	B	lower view pt	1774	080	11	27793 41560	Lunga, northern half of east side; birds eye view from lower view point
14/08/2003	Team 1 IMTD	B	lower view pt	1775	080	11	27793 41560	Lunga, northern half of east side; birds eye view from lower view point
14/08/2003	Team 1 IMTD	B	lower view pt	1776	080	11	27793 41560	Lunga, northern half of east side; birds eye view from lower view point
14/08/2003	Team 1 IMTD	B	lower view pt	1777	080	11	27793 41560	Lunga, northern half of east side; birds eye view from lower view point
14/08/2003	Team 1 IMTD	B	lower view pt	1778	080	11	27793 41560	Lunga, northern half of east side; birds eye view from lower view point
14/08/2003	Team 1 IMTD	B	lower view pt	1779	080	11	27793 41560	Lunga, northern half of east side; birds eye view from lower view point
14/08/2003	Team 1 IMTD	B	lower view pt	1780	080	11	27793 41560	Lunga, northern half of east side; birds eye view from lower view point
14/08/2003	Team 1 IMTD	B	lower view pt	1781	190	11	27793 41560	Lunga, northern half of east side; birds eye view from lower view point
14/08/2003	Team 1 IMTD	B	from RIB	1782	270		28160 41819	Lunga, northern half of east side; cave on east coast Lunga from RIB



Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
14/08/2003	Team 1 IMTD	B	from RIB	1783	270			Vertical cliffs 1 just to south of cave, east coast Lunga from RIB
14/08/2003	Team 1 IMTD	B	from RIB	1784	270		28064 41837	Cliffs 2 just to south of cave, east coast Lunga, close-up
14/08/2003	Team 1 IMTD	B	from RIB	1785	270			Cliffs 3, east coast Lunga, continuing south from photo 1784
14/08/2003	Team 1 IMTD	B	from RIB	1786	270		28011 41676	Cliffs 4, east coast Lunga, continuing south from photo 1785
14/08/2003	Team 1 IMTD	B	from RIB	1787	270		27954 41621	Cliffs 5, east coast Lunga, continuing south from photo 1786 – south end of tall cliff section
14/08/2003	Team 1 IMTD	B	from RIB	1788	270		27928 41589	Climb-out-Area, south end of tall cliffs on east side of Lunga
14/08/2003	Team 1 IMTD	B	from RIB	1789	NW		27874 41595	Close up of climb out area, south end of tall cliffs on east side of Lunga
14/08/2003	Team 1 IMTD	B	from RIB	1790	NW			Grassy promontory with BPat/Ver on steep sides; midway down east side of Lunga.
14/08/2003	Team 1 IMTD	B	from RIB	1791	NW		27850 41498	<i>F. ves</i> area next to grassy promontory; midway down east side of Lunga.
14/08/2003	Team 1 IMTD	B	from RIB	1792	NW		27805 41478	VerPor biotope area (photo 1779 from above); midway down east side of Lunga.
14/08/2003	Team 1 IMTD	B	from RIB	1793			27779 41453	Cave; midway down east side of Lunga near 'waist' of island.
14/08/2003	Team 2 JPH	A		159	240			East shore Lunga from offshore & islet next to shore
14/08/2003	Team 2 JPH	A		160	240			East shore Lunga from offshore & islet next to shore
14/08/2003	Team 2 JPH	A	1	161	093	1		Lunga, southern half; General shot of Yellow and grey lichens of polygon 1
14/08/2003	Team 2 JPH	A	1	162		1	27715 41209	Lunga, southern half; close up of boulders/lichens in polygon 1
14/08/2003	Team 2 JPH	A	1	163			27725 41196	Lunga, southern half; close up of boulders/lichens in polygon 1
14/08/2003	Team 2 JPH	A	2	164			27736 41202	Lunga, southern half; <i>Pelvetia</i> and <i>Patella vulgata</i> in polygon 2
14/08/2003	Team 2 JPH	A	2	165			27736 41202	Lunga, southern half; Barnacles in polygon 2 - <i>Chthamalus</i>
14/08/2003	Team 2 JPH	A		166			27736 41202	Lunga, southern half; <i>Littorina littorea</i> in polygon 2
14/08/2003	Team 2 JPH	A		167			27743 41194	Lunga, southern half; rock pools in polygon 2
14/08/2003	Team 2 JPH	A		168	015		27743 41194	Lunga, southern half; overview of BPat/ver
14/08/2003	Team 2 JPH	A	4	169			27738 41190	Lunga, southern half; close up of BPat polygon 4
14/08/2003	Team 2 JPH	A	3	170			27739 41187	Lunga, southern half; close up of Ver polygon id with Lichina

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
14/08/2003	Team 2 JPH	A		173		2	27748 41191	Lunga, southern half; TARGET NOTE 1 - under boulder community
14/08/2003	Team 2 JPH	A		175		2	27748 41191	Lunga, southern half; rock pool under boulders
14/08/2003	Team 2 JPH	A		176		2	27748 41191	Lunga, southern half; sponges/ <i>Actinia</i> under boulders
14/08/2003	Team 2 JPH	A	4	177			27753 41190	Lunga, southern half; orange sponge
14/08/2003	Team 2 JPH	A		178			27758 41189	Lunga, southern half; green sponge under boulders
14/08/2003	Team 2 JPH	A		179			27758 41189	Lunga, southern half; green sponge under boulders
14/08/2003	Team 2 JPH	A	5	180		3	27768 41179	Lunga, southern half; <i>Fves.B</i> polygon close up
14/08/2003	Team 2 JPH	A		181	077	3	27768 41179	Lunga, southern half; <i>Fves.B</i> polygon overview
14/08/2003	Team 2 JPH	A		182		3	27768 41179	Lunga, southern half; <i>Fves.B</i> polygon overview
14/08/2003	Team 2 JPH	A	6	183		4	27766 41169	Lunga, southern half; FK rock pool
14/08/2003	Team 2 JPH	A		185			27766 41169	Lunga, southern half; FK rock pool
14/08/2003	Team 2 JPH	A		186			27789 41136	Lunga, southern half; polygon 5
14/08/2003	Team 2 JPH	A	7/8	187			27787 41133	Lunga, southern half; boundary of <i>L. dig</i> and <i>F. serr</i>
14/08/2003	Team 2 JPH	A	7	188			27787 41133	Lunga, southern half; <i>F. serr</i>
14/08/2003	Team 2 JPH	A	8	189			27787 41133	Lunga, southern half; <i>L. dig</i>
14/08/2003	Team 2 JPH	A	7	190			27787 41133	Lunga, southern half; close up of species in <i>F. serr</i> polygon id
14/08/2003	Team 2 JPH	A	8	191		5	27783 41126	Lunga, southern half; communities on boulders under <i>L. dig</i>
14/08/2003	Team 2 JPH	A		192			27783 41126	Lunga, southern half; communities on boulders under <i>L. dig</i>
14/08/2003	Team 2 JPH	A		193	114		27718 41227	Lunga, southern half; zonation of kelp to cliff
14/08/2003	Team 2 JPH	A		194	141		27718 41227	Lunga, southern half; plateau of transect 1
14/08/2003	Team 2 JPH	A	cliff	195	119	7	27698 41149	Lunga, southern half; shore view - area of <i>Pe/B</i> border
14/08/2003	Team 2 JPH	A	cliff	196	156	7	27698 41149	Lunga, southern half; zonation view
14/08/2003	Team 2 JPH	A		197	166		27668 41132	Lunga, southern half; view down shore of large pools
14/08/2003	Team 2 JPH	A		198	160	8	27651 41102	Lunga, southern half; <i>Pelvetia</i> and pool zonation

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
14/08/2003	Team 2 JPH	A		199	189	8	27651 41102	Lunga, southern half; view out of kelp zone down shore
14/08/2003	Team 2 JPH	A		200	238	8	27651 41102	Lunga, southern half; YG band on cliff face
14/08/2003	Team 2 JPH	A		201	143	9	27505 41136	Lunga, southern half; view down gully to barren boulders and cobbles
14/08/2003	Team 2 JPH	A		202	153	11	27565 41046	Lunga, southern half; kelp zone
14/08/2003	Team 2 JPH	A		203	244		27510 41052	Lunga, southern half; Enteromorpha biotope on large boulders
14/08/2003	Team 2 JPH	A		204	153		27406 41058	Lunga, southern half; cliff face zonation
14/08/2003	Team 2 JPH	A		205	246	13	27391 40959	Lunga, southern half; view down from cliff
14/08/2003	Team 2 JPH	A		206	301	13	27391 40959	Lunga, southern half; cliff face zonation
14/08/2003	Team 2 JPH	A		207	184	14	27329 40900	Lunga, southern half; small island with Him on top
14/08/2003	Team 2 JPH	A		208	202	14	27329 40900	Lunga, southern half; zonation down vertical cliff and lower shore
14/08/2003	Team 2 JPH	A		209		15	27273 40859	Lunga, southern half; mussels bio
14/08/2003	Team 2 JPH	A		210	285	15	27273 40859	Lunga, southern half; boulders and ENT biotope
14/08/2003	Team 2 JPH	A		211	238	16	27226 40893	Lunga, southern half; YG/ver section of plateau area
14/08/2003	Team 2 JPH	A		212	280	16	27226 40893	Lunga, southern half; middle section of pools and shore <i>BPat.Fves</i>
14/08/2003	Team 2 JPH	A		213	309	16	27226 40893	Lunga, southern half; <i>Ver/BPat</i> section
14/08/2003	Team 2 JPH	A		214	197	16	27226 40893	Lunga, southern half; <i>Porphyra</i> on barnacle biotope
14/08/2003	Team 2 JPH	A		215	341	17	27129 40977	Lunga, southern half; 2 seals
14/08/2003	Team 2 JPH	A		216	341	17	27129 40977	Lunga, southern half; view of rocks below cliff
14/08/2003	Team 2 JPH	A		217	344	18	27731 41355	Lunga, southern half; view into cobble bay
15/08/2003	Team 1 PAC	B	1	1823	334	1		Lunga, northern half of west coast; from top of Barsh beach back to water
15/08/2003	Team 1 PAC	B		1824	284			Lunga, northern half of west coast; from NE side of beach looking across to W
15/08/2003	Team 1 PAC	B		1825	036			Lunga, northern half of west coast; from SE side of beach view up coast
15/08/2003	Team 1 PAC	B	2	1826				Lunga, northern half of west coast; on boulder beach - rocks with <i>Littorina littorea</i> .
15/08/2003	Team 1 PAC	B		1827			27582 41581	Lunga, northern half of west coast; <i>F. ves/Enteromorpha</i> .

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
15/08/2003	Team 1 PAC	B	10	1828			27582 41623	Lunga, northern half of west coast; <i>S. balanoides</i> & <i>Mytilus</i>
15/08/2003	Team 1 PAC	B	10	1829				Lunga, northern half of west coast; <i>Bladderless F. ves</i>
15/08/2003	Team 1 PAC	B	10	1830				Lunga, northern half of west coast; <i>Bladderless F. ves</i>
15/08/2003	Team 1 PAC	B	10	1831				Lunga, northern half of west coast; <i>Enc. coralline</i> alga rock pools sub biotope
15/08/2003	Team 1 PAC	B	10	1832				Lunga, northern half of west coast; <i>Enc. coralline</i> alga rock pools sub biotope
15/08/2003	Team 1 PAC	B	11	1833				Lunga, northern half of west coast; <i>Alaria</i>
15/08/2003	Team 1 PAC	B	11	1834				Lunga, northern half of west coast; close up <i>Osmundea</i> /orange sponge
15/08/2003	Team 1 PAC	B	10	1835				Lunga, northern half of west coast; close up sponge
15/08/2003	Team 1 PAC	B	10	1836				Lunga, northern half of west coast; close up sponge
15/08/2003	Team 1 PAC	B	2	1837	038		27606 41630	Lunga, northern half of west coast; up coast
15/08/2003	Team 1 PAC	B	2	1838	220		27606 41630	Lunga, northern half of west coast; down coast
15/08/2003	Team 1 PAC	B		1839	086		27525 41796	Lunga, northern half of west coast; on boat - 'shot to shore', kelp on subtidal plateau
15/08/2003	Team 1 PAC	B		1840	030		27525 41796	Lunga, northern half of west coast; on boat - outcrop (large rock outcrop)
15/08/2003	Team 1 PAC	B		1841	102			Lunga, northern half of west coast; on boat - kelp plateau
15/08/2003	Team 1 PAC	B		1842	045		27601 41820	Lunga, northern half of west coast; damp green plateau on shore position 27601 41820
15/08/2003	Team 1 PAC	B		1843			27601 41820	Lunga, northern half of west coast; close ups on wet patch - <i>Mastocarpus</i> ?
15/08/2003	Team 1 PAC	B		1844			27601 41820	Lunga, northern half of west coast; close ups on wet patch - sponge brown weed
15/08/2003	Team 1 PAC	B		1845	112	3		Lunga, northern half of west coast; from boat shore shot - <i>BPat</i> with mast
15/08/2003	Team 1 PAC	B		1846	112	3		<i>f Lunga</i> , northern half of west coast; rom boat shore shot - <i>BPat</i> with mast
15/08/2003	Team 1 PAC	B		1847			27549 41969	Lunga, northern half of west coast; from boat - green patches on upper shore
15/08/2003	Team 1 PAC	B	12	1848		4		Lunga, northern half of west coast; <i>V.por</i> polygon close ups
15/08/2003	Team 1 PAC	B	12	1849		4		Lunga, northern half of west coast; <i>V.por</i> polygon close ups
15/08/2003	Team 1 PAC	B	12	1850		4		Lunga, northern half of west coast; <i>V.por</i> polygon close ups

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
15/08/2003	Team 1 PAC	B		1851	045		27535 42064	Lunga, northern half of west coast; photos up-shore from boat (next bird stack)
15/08/2003	Team 1 PAC	B		1852	096		27535 42064	Lunga, northern half of west coast; photos up-shore from boat (next bird stack)
15/08/2003	Team 1 PAC	B		1853	045		27535 42064	Lunga, northern half of west coast; photos up-shore from boat (next bird stack)
15/08/2003	Team 1 PAC	B		1854		5		Lunga, northern half of west coast; close ups of biotopes on rock faces at this waypoint
15/08/2003	Team 1 PAC	B		1855		5		Lunga, northern half of west coast; close ups of biotopes on rock faces at this waypoint
15/08/2003	Team 1 PAC	B		1856		5		Lunga, northern half of west coast; close ups of biotopes on rock faces at this waypoint
15/08/2003	Team 1 PAC	B		1857		5		Lunga, northern half of west coast; close ups of biotopes on rock faces at this waypoint
15/08/2003	Team 1 PAC	B		1858		5		Lunga, northern half of west coast; close ups of biotopes on rock faces at this waypoint
15/08/2003	Team 1 PAC	B		1859		5		Lunga, northern half of west coast; close ups of biotopes on rock faces at this waypoint
15/08/2003	Team 1 PAC	B		1860		5		Lunga, northern half of west coast; close ups of biotopes on rock faces at this waypoint
15/08/2003	Team 1 PAC	B		1861		6		Lunga, northern half of west coast; barsh beach
15/08/2003	Team 1 PAC	B		1862	090	6		Lunga, northern half of west coast; photos up-shore from Barsh beach cave
15/08/2003	Team 1 PAC	B		1863	072	6		Lunga, northern Barsh beach cave
15/08/2003	Team 1 PAC	B		1864	072	6		Lunga, northern half of west coast; photos up-shore from Barsh beach cave
15/08/2003	Team 1 PAC	B		1865	094	7	27911 42411	Lunga, northern half of west coast; photos of coast and small bay
15/08/2003	Team 1 PAC	B		1866	158	7	27911 42411	Lunga, northern half of west coast; photos of coast and small bay
15/08/2003	Team 1 PAC	B		1867	030		27894 42522	Lunga, northern half of west coast; up coast
15/08/2003	Team 1 PAC	B		1868			27894 42522	Lunga, northern half of west coast; <i>Pe/B.</i> (zone)
15/08/2003	Team 1 PAC	B		1869			27894 42522	Lunga, northern half of west coast; <i>BPat Pe/B</i> (zone)
15/08/2003	Team 1 PAC	B		1870	000		27941 42558	Lunga, northern half of west coast; across channel to other island

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
15/08/2003	Team 1 PAC	B		1871	000			Lunga, northern half of west coast; from final high point looking @ area (14/08 & 15/08 - island done over 2 days)
15/08/2003	Team 1 PAC	B		1872	000			Lunga, northern half of west coast; from final high point looking towards northern shingle spit and Sgeir a' Chaisteil.
15/08/2003	Team 1 PAC	B		1873				Lunga, northern half of west coast; photo along Sgeir a' Chaisteil from south
15/08/2003	Team 1 PAC	B		1874				Sgeir a' Chaisteil western coast from RIB, showing <i>AlaLdig</i> zone at edge, with <i>BPatFvesL</i> zone on top of wide rocky platform.
15/08/2003	Team 1 PAC	B		1875				Sgeir a' Chaisteil western coast from RIB
15/08/2003	Team 1 PAC	B		1876				Sgeir a' Chaisteil western coast from RIB
15/08/2003	Team 1 PAC	B		1877	NE	8		View to NE from top of lichen zone, northern end of Tighchoie
15/08/2003	Team 1 PAC	B		1878	040	8		View to E from top of lichen zone, northern end of Tighchoie
15/08/2003	Team 1 PAC	B		1879		8		View to S from top of lichen zone, northern end of Tighchoie
15/08/2003	Team 1 PAC	B		1880	180	8		View to S from top of lichen zone, northern end of Tighchoie
15/08/2003	Team 1 PAC	B		1881				Tighchoie; rock pool in centre of island
15/08/2003	Team 1 PAC	B		1882	342		29244 43499	Tighchoie; from gully cutting through centre of island towards wpt 8.
15/08/2003	Team 1 PAC	B		1883	102?		T-Choi.	Tighchoie; from boat - shot from west to east
15/08/2003	Team 1 PAC	B		1884	000		T-Choi.	Tighchoie; from boat - southern tip to north
15/08/2003	Team 1 PAC	B		1885	000		T-Choi.	Tighchoie; from boat - southern tip to north
15/08/2003	Team 2 ANC	A		218	321		27120 40861	Lunga, south half of west coast; rock pool on plateau to south of Lunga. Cor. G pool
15/08/2003	Team 2 ANC	A		219	192		27120 40861	Lunga, south half of west coast; rock pool on plateau to south of Lunga. Cor. G pool
15/08/2003	Team 2 ANC	A		221			27070 40830	Lunga, south half of west coast; MytB polygon
15/08/2003	Team 2 ANC	A		222			27070 40830	Lunga, south half of west coast; B.Pat <i>Por</i> overview (tip of plateau)
15/08/2003	Team 2 ANC	A		223			27070 40830	Lunga, south half of west coast; <i>BPat Por</i> close-up (tip of plateau)
15/08/2003	Team 2 ANC	A		224			27077 40818	Lunga, south half of west coast; <i>VerPor</i> biotope close-up
15/08/2003	Team 2 ANC	A		225			27077 40818	Lunga, south half of west coast; <i>VerPor</i> biotope close-up

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
15/08/2003	Team 2 ANC	A		226				Lunga, south half of west coast; <i>MytB</i> biotope close-up
15/08/2003	Team 2 ANC	A		227			27062 40831	Lunga, south half of west coast; <i>Fucus</i> sp. Ch very edge of plateau (in <i>MytB</i> )
15/08/2003	Team 2 ANC	A	17	228		2	27036 40851	Lunga, south half of west coast; <i>FvesB</i> with <i>Mytilus</i>
15/08/2003	Team 2 ANC	A	17	229	028	2	27036 40851	Lunga, south half of west coast; extent of polygon ID 17
15/08/2003	Team 2 ANC	A	17	230				Lunga, south half of west coast; <i>Sagartia</i> (?) in <i>F. vesB</i> & <i>Mytilus</i>
15/08/2003	Team 2 ANC	A		231	296		27109 40973	Lunga, south half of west coast; <i>Lichina</i> into <i>BPat</i> on rock
15/08/2003	Team 2 ANC	A		232	262		27107 41016	Lunga, south half of west coast; outlying islands topped with <i>FvesB</i>
15/08/2003	Team 2 ANC	A		233	340		27107 41016	Lunga, south half of west coast; outlying islands topped with <i>FvesB</i>
15/08/2003	Team 2 ANC	A		234	058		27107 41016	Lunga, south half of west coast; <i>BPat lich</i> (?) south west corner
15/08/2003	Team 2 ANC	A		235		3	27124 41052	Lunga, south half of west coast; <i>Lichina</i> / <i>ver</i> @ edge of <i>BPat</i>
15/08/2003	Team 2 ANC	A		236	028		27124 41052	Lunga, south half of west coast; zonation on rock ledge, <i>Lichina</i> and <i>Mytilus</i> .
15/08/2003	Team 2 ANC	A		237			27124 41052	Lunga, south half of west coast; mussels
15/08/2003	Team 2 ANC	A		238	223		27154 41094	Lunga, south half of west coast; vertical zonation on rock edge
15/08/2003	Team 2 ANC	A		239			27160 41119	Lunga, south half of west coast; <i>Alaria</i> @ waters edge
15/08/2003	Team 2 ANC	A		240	312	4	27129 41002	Lunga, south half of west coast; <i>Himanthalia</i>
15/08/2003	Team 2 ANC	A		241	329	4	27129 41002	Lunga, south half of west coast; middle area between <i>Himanthalia</i> and <i>BPat</i> variant
15/08/2003	Team 2 ANC	A		242	011		27191 41123	Lunga, south half of west coast; small outcrop with Him. and kelp around edge
15/08/2003	Team 2 ANC	A		243	299		27258 41157	Lunga, south half of west coast; boulders with <i>Enteromorpha</i> and <i>Palmaria palmata</i>
15/08/2003	Team 2 ANC	A		244	350	5	27279 41219	Lunga, south half of west coast; <i>F. serr</i> and <i>Lam.</i> Dig outcrop
15/08/2003	Team 2 ANC	A		245	close up	7	27295 41226	Lunga, south half of west coast; <i>Ent por</i> boulder
15/08/2003	Team 2 ANC	A		246	close up		27296 41241	Lunga, south half of west coast; <i>F. serr</i> / <i>L. dig</i> biotope
15/08/2003	Team 2 ANC	A		247	343	8	27341 41242	Lunga, south half of west coast; photos down-shore from <i>Enteromorpha</i> . Islands of <i>L. dig</i>
15/08/2003	Team 2 ANC	A		248	029	8	27341 41242	Lunga, south half of west coast; shore zonation and cliffs

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
15/08/2003	Team 2 ANC	A		249	323	9	27436 41241	Lunga, south half of west coast; view down gully
15/08/2003	Team 2 ANC	A		250	278	11	27452 41405	Lunga, south half of west coast; <i>Pel B</i> and <i>B pat</i> by kelp
15/08/2003	Team 2 ANC	A		251	301	11	27452 41405	Lunga, south half of west coast; view down shore
15/08/2003	Team 2 ANC	A		252	336	11	27452 41405	Lunga, south half of west coast; outcrops with <i>F. serr</i> and <i>L. dig</i>
15/08/2003	Team 2 ANC	A		253	288	12	27512 41433	Lunga, south half of west coast; pelvetia and rock pools in upper shore
15/08/2003	Team 2 ANC	A		254	351	12	27512 41433	Lunga, south half of west coast; shore zonation including edge of cliff
15/08/2003	Team 2 ANC	A		255	325	14	27509 41519	Lunga, south half of west coast; shore zonation Ver band before pel on upper shore
15/08/2003	Team 2 ANC	A		256	350		27536 41550	Lunga, south half of west coast; group of small rocks off coast
15/08/2003	Team 2 ANC	A		257	046		27536 41550	Lunga, south half of west coast; shore zonation ending with <i>BPat</i> boulders and <i>F. serr</i> and <i>Himanthalia</i>
15/08/2003	Team 2 ANC	A		258	024		27536 41550	Lunga, south half of west coast; view of cliffs in northern section of shore
16/08/2003	Team 1 PAC	D	Y/G	1886	198	1		Rock to east (or part of?) of <i>Sgeirean na Giusaich</i> ; cliffs on island showing Y/S, V. maura and <i>BPat</i>
16/08/2003	Team 1 PAC	D	Y/G	1887	0220		28879 42723	Rock to east (or part of?) of <i>Sgeirean na Giusaich</i> ; top of island
16/08/2003	Team 1 PAC		Y/G	1888	256		28875 42722	Rock to east (or part of?) of <i>Sgeirean na Giusaich</i> ; rocks at base of cliff with <i>BPatFvesL</i>
16/08/2003	Team 1 PAC			1889	256		28875 42722	Rock to east (or part of?) of <i>Sgeirean na Giusaich</i> ; rocks at base of cliff with <i>BPatFvesL</i>
16/08/2003	Team 1 PAC			1890	290		28866 42745	Rock to east (or part of?) of <i>Sgeirean na Giusaich</i> ; rocks at base of cliff with <i>BPatFvesL</i>
16/08/2003	Team 1 PAC			1891	090			Rocks to east (or part of?) of <i>Sgeirean na Giusaich</i> ; second island visited, showing <i>BPat</i> and Ver on vertical faces.
16/08/2003	Team 1 PAC			1892	050		28767 42632	Himanthalia plateau second island; rocks to east (or part of?) of <i>Sgeirean na Giusaich</i>
16/08/2003	Team 1 PAC			1893			28767 42632	Himanthalia plateau second island; rocks to east (or part of?) of <i>Sgeirean na Giusaich</i>
16/08/2003	Team 1 PAC			1894		2		<i>F. serr</i> plateau second island close ups <i>F. serr</i> & <i>Mastocarpus</i> ; rocks to east (or part of?) of <i>Sgeirean na Giusaich</i>
16/08/2003	Team 1 PAC			1895		2		<i>F.serr</i> plateau second island close ups <i>F.serr</i> / <i>Ascophyllum</i> ; rocks to east (or part of?) of <i>Sgeirean na Giusaich</i>



Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
16/08/2003	Team 1 PAC			1896	286	2		<i>F. serr</i> plateau second island general view <i>F. serr</i> / <i>Ascophyllum</i> ; rocks to east (or part of?) of <i>Sgeirean na Giusaich</i>
16/08/2003	Team 1 PAC			1897	210	3		Cluster of small islets to east (and south) of <i>Sgeirean na Giusaich</i> – towards <i>Sgeiran Mor</i> to south.
16/08/2003	Team 1 PAC			1898	140	3		Cluster of small islets to east (and south) of <i>Sgeirean na Giusaich</i> – towards <i>Sgeiran Mor</i> to south. <i>BPatFvesL</i> .
16/08/2003	Team 1 PAC			1899		3		Cluster of small islets to east (and south) of <i>Sgeirean na Giusaich</i> – towards <i>Sgeiran Mor</i> to south. Midshore <i>F. ves</i> (avesiculate) with barnacles, dog whelks and Enteromorpha.
16/08/2003	Team 1 PAC			1900		3		Cluster of small islets to east (and south) of <i>Sgeirean na Giusaich</i> – towards <i>Sgeiran Mor</i> to south. Close-up of <i>F. ves linearis</i> .
16/08/2003	Team 1 PAC	?		1901	000	9		First small rock to east of <i>Sgeir an Fheoir</i> ; <i>V. maura</i> zone on top with some <i>Pelvetia</i> .
16/08/2003	Team 1 PAC			1902		9		First small rock to east of <i>Sgeir an Fheoir</i> ; close up of <i>V. maura</i> / <i>pel</i> / <i>F.ves</i>
16/08/2003	Team 1 PAC			1903			29131 42965	Large shallow reef between <i>Sgeirean na Giusaich</i> and <i>Bogha Ruadh</i> – mix of <i>L. dig</i> and <i>Himanthalia</i> .
16/08/2003	Team 1 PAC			1904			29131 42965	Large shallow reef between <i>Sgeirean na Giusaich</i> and <i>Bogha Ruadh</i> – mix of <i>L. dig</i> and <i>Himanthalia</i> .
16/08/2003	Team 1 PAC	F	L.dig	1905	050	10		View NE to <i>Fladda</i> from south end of large shallow reef between <i>Sgeirean na Giusaich</i> and <i>Bogha Ruadh</i> – small areas of barnacle-covered rocks amongst <i>L. dig</i> and <i>Himanthalia</i> .
16/08/2003	Team 1 PAC			1906	280	11		From third rock to east of <i>Sgeir an Fheoir</i> ; view NW past <i>Sgeir an Fheoir</i> to <i>Sgeir an Eirionnaich</i> in distance
16/08/2003	Team 1 PAC			1907	250	11		From third rock to east of <i>Sgeir an Fheoir</i> ; view SW past <i>Sgeir an Fheoir</i> to <i>Sgeir a' Chaisteil</i> in distance
16/08/2003	Team 1 PAC			1908	340	11		From third rock to east of <i>Sgeir an Fheoir</i> ; view NNW to <i>Sgeir na h-Iolair</i> in distance
16/08/2003	Team 1 PAC		V.mau	1909	290			Second rock to east of <i>Sgeir an Fheoir</i> ; view towards waypoint 12 on top.
16/08/2003	Team 1 PAC			1910	110			<i>Bogha Ruadh</i> – view on approach from NW.
16/08/2003	Team 1 PAC			1911		13		<i>Bogha Ruadh</i> - close up barnacles, limpets and Enteromorpha.
16/08/2003	Team 1 PAC			1912		13		<i>Bogha Ruadh</i> - close up barnacles, limpets and Enteromorpha.
16/08/2003	Team 1 PAC			1913				Seal on <i>Bogha Ruadh</i>

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
16/08/2003	Team 1 PAC			1914		14		Low lying <i>L. dig</i> islands with seals, just north of Sgeirean Mor (out of focus)
16/08/2003	Team 1 PAC			1915		14		Seals around rock just north of Sgeirean Mor
16/08/2003	Team 1 PAC			1916				<i>Alg L.dig</i> (small patch) on low lying rocks just north of Sgeirean Mor.
16/08/2003	Team 1 PAC			1917				Seal (out of focus)
16/08/2003	Team 2 ADC	H	1	259	234		29006 43873	Sgeir na h-lolaire; Y/G on top shore
16/08/2003	Team 2 ADC		1	260			29006 43873	Sgeir na h-lolaire; close up of Y/G - low green turf
16/08/2003	Team 2 ADC		1	261		1	29006 43873	Sgeir na h-lolaire; close up of Y/G - low green turf
16/08/2003	Team 2 ADC		2	262	325		29000 43897	Sgeir na h-lolaire; vertical zonation on rock edge
16/08/2003	Team 2 ADC		2	263			29001 43897	Sgeir na h-lolaire; close up of green turf on ver
16/08/2003	Team 2 ADC		2	264			29002 43897	Sgeir na h-lolaire; close up of green turf on ver / por on ver
16/08/2003	Team 2 ADC		3	265	297		29011 43900	Sgeir na h-lolaire; <i>F. spi</i>
16/08/2003	Team 2 ADC		3	266			29011 43900	Sgeir na h-lolaire; <i>F. spi</i> & <i>Pel</i>
16/08/2003	Team 2 ADC		4	267			29006 43906	Sgeir na h-lolaire; <i>F. ves B</i> (video clip?)
16/08/2003	Team 2 ADC		4	268	292		29006 43906	Sgeir na h-lolaire; <i>F. ves B</i>
16/08/2003	Team 2 ADC			269			29006 43906	Sgeir na h-lolaire; Close up of bladderless <i>F. ves</i> and sporelings
16/08/2003	Team 2 ADC			270			29029 43919	Sgeir na h-lolaire; <i>Fucus</i> sporelings and <i>Nucella</i>
16/08/2003	Team 2 ADC			271			29029 43919	Sgeir na h-lolaire; <i>Halichondria</i> in crevice, lower shore
16/08/2003	Team 2 ADC			272	030		28942 43912	Sgeir na h-lolaire; <i>F. ves B</i> lower shore to <i>L. dig</i>
16/08/2003	Team 2 ADC		5	273			28955 43918	Sgeir na h-lolaire; <i>BPat</i> ( <i>Lichina</i> on <i>BPat</i> )
16/08/2003	Team 2 ADC		6	274			28951 43931	Sgeir na h-lolaire; <i>L. dig</i> polygon
16/08/2003	Team 2 ADC			275	212		28947 45904	Sgeir na h-lolaire; zonation on west side rocks
16/08/2003	Team 2 ADC			276	196			Sgeir na h-lolaire; <i>L. dig</i> with <i>F. ves B</i>
16/08/2003	Team 2 ADC			277	147		28905 43842	Sgeir na h-lolaire; <i>BPat</i> rocks on <i>L. dig</i>
16/08/2003	Team 2 ADC			278	168		29004 43831	Sgeir na h-lolaire; <i>F. ves</i> with <i>BPat</i> on boulders

Date	Photographer	Map no	Field polygon ID	Phot ID	Direct of view (deg)	Wpt no	Position (OSGB36, OS grid)	Description
16/08/2003	Team 2 ADC			279				Sgeir na h-lolaire; encrusting organisms under boulders
16/08/2003	Team 2 ADC		7	280		4		Sgeir na h-lolaire; <i>F. ves</i> with bladders
16/08/2003	Team 2 ADC		7	281		4		Sgeir na h-lolaire; under boulder communities in 7
16/08/2003	Team 2 ADC		8	282	107	5		Sgeir na h-lolaire; <i>Enteromorpha</i> on boulders
16/08/2003	Team 2 ADC		9	283	040	6	29055 43870	Sgeir na h-lolaire; <i>F. serr</i> polygon
16/08/2003	Team 2 ADC			284	250		28935 43707	Sgeir na h-lolaire; Islands 1
16/08/2003	Team 2 ADC			285				Sgeir na h-lolaire; zonation on islands edge from boat
16/08/2003	Team 2 ADC			286	066		28789 43749	Sgeir na h-lolaire; zonation on islands edge from boat
16/08/2003	Team 2 ADC			287				Sgeir na h-lolaire; zonation on islands edge from boat
16/08/2003	Team 2 ADC			288				Sgeir na h-lolaire; zonation on islands edge from boat
16/08/2003	Team 2 ADC		11	289	216		28852 43348	Sgeir an Fheoir; <i>Ascophyllum nodosum</i> on north end
16/08/2003	Team 2 ADC			290			28811 43297	Sgeir an Fheoir; close of barnacles ( <i>S. balanoides</i> ) on <i>Ascophyllum</i> . Nod
16/08/2003	Team 2 ADC		12	291	187	7	28806 43281	Sgeir an Fheoir; <i>Pel.B</i>
16/08/2003	Team 2 ADC			292			28806 43281	Sgeir an Fheoir; <i>Fucus ceranoides</i> in channels
16/08/2003	Team 2 ADC			293	249		28733 43262	Sgeir an Fheoir; <i>F.ves/Asc.</i> into <i>L.dig</i>
16/08/2003	Team 2 ADC			294	206		28733 43262	Sgeir an Fheoir; <i>Asc.</i> Between island rocks
16/08/2003	Team 2 ADC			295	175		28739 43176	Sgeir an Fheoir; <i>Asc.</i> To Him in bay
16/08/2003	Team 2 ADC			296	255		28743 43142	Sgeir an Fheoir; Rock edge zonation
16/08/2003	Team 2 ADC			297	011		28787 45154	Sgeir an Fheoir; Bay/Inlet

**Appendix 3 - Waypoint log from intertidal survey, Treshnish Isles biotope mapping survey, August 2003**

Pair or team	Surveyor	Date	Time	Map no	Field Poly ID	Waypoint no	Position (OS grid)	Datum
ERT 1	PAC	11/08/2003	13:07	I	1 (top)	1	30797 44996	OSGB
ERT 1	PAC	11/08/2003	13:18	I	1/2	2	30795 45035	OSGB
ERT 1	PAC	11/08/2003	13:29	I	2	3	30790 45938	OSGB
ERT 1	PAC	11/08/2003	13:31	I	3	4	30791 45046	OSGB
ERT 1	PAC	11/08/2003	13:42	I	3/4	5	30793 45054	OSGB
ERT 1	PAC	11/08/2003	13:46	I	4	6	30797 45058	OSGB
ERT 1	PAC	11/08/2003	13:55	I	4/5	7	30808 45071	OSGB
ERT 1	PAC	11/08/2003	14:14	I	Hill	8	30856 45017	OSGB
ERT 1	PAC	11/08/2003	14:14	I	Hill	9	30893 45013	OSGB
ERT 1	PAC	11/08/2003	14:31	I	Hill	10	30908 45024	OSGB
ERT 1	PAC	11/08/2003	14:35	I	Hill	11	30929 44975	OSGB
ERT 1	PAC	11/08/2003	14:44	I	Hill	12	30891 44937	OSGB
ERT 1	PAC	11/08/2003	15:02	I	1	13	30922 44892	OSGB
ERT 1	PAC	11/08/2003	15:05	I	7	14	30917 44895	OSGB
ERT 1	PAC	11/08/2003	15:11	I	7/2	15	30923 44893	OSGB
ERT 1	PAC	11/08/2003	15:12	I	2	16	30933 44901	OSGB
ERT 1	PAC	11/08/2003	15:14	I	2/3	17	30939 44896	OSGB
ERT 1	PAC	11/08/2003	15:22	I	3/4	18	30960 44897	OSGB
ERT 1	PAC	11/08/2003	15:26	I	4	19	30963 44895	OSGB
ERT 1	PAC	11/08/2003	15:40	I	Across archway	20	30790 44916	OSGB
ERT 2	JPH	11/08/2003	11:04	I	N/A	1	31616 44963	OSGB
ERT 2	JPH	11/08/2003	11:25	I	1/2	2	30584 44992	OSGB
ERT 2	JPH	11/08/2003	11:47	I	3	3	30593 45018	OSGB
ERT 2	JPH	11/08/2003	11:52	I	4	4	30588 45003	OSGB
ERT 2	JPH	11/08/2003	12:10	I	5	5	30588 45030	OSGB
ERT 2	JPH	11/08/2003	12:25	I	6	6	30573 45045	OSGB
ERT 2	JPH	11/08/2003	13:04	I		7	30510 44898	OSGB
ERT 2	JPH	11/08/2003	13:15	I		8	30650 44890	OSGB
ERT 2	JPH	11/08/2003	13:29	I		9	30530 44744	OSGB
ERT 2	JPH	11/08/2003	13:59	I	10	10	30644 44954	OSGB
ERT 2	JPH	11/08/2003	14:05	I	13	11	30668 44946	OSGB
ERT 2	JPH	11/08/2003	14:13	I		12	30702 44928	OSGB
ERT 2	JPH	11/08/2003	14:17	I		13	30686 44898	OSGB
ERT 2	JPH	11/08/2003	14:21	I	16	14	30697 44870	OSGB
ERT 2	JPH	11/08/2003	14:30	I	17	15	30691 44835	OSGB
ERT 2	JPH	11/08/2003	14:51	I	18	16	30700 44732	OSGB

Pair or team	Surveyor	Date	Time	Map no	Field Poly ID	Waypoint no	Position (OS grid)	Datum
ERT 1	PAC	12/08/2003	11:36		3/4	1	30048 43711	OSGB
ERT 1	PAC	12/08/2003	12:06		2/3	2	30033 43738	OSGB
ERT 1	PAC	12/08/2003	12:33		1/2	3	30023 43747	OSGB
ERT 1	PAC	12/08/2003	12:38		1	4	30019 43760	OSGB
ERT 1	PAC	12/08/2003	12:46		5	5	30088 43726	OSGB
ERT 1	PAC	12/08/2003	13:15			6	30014 43767	OSGB
ERT 1	PAC	12/08/2003	13:25			7	30077 43797	OSGB
ERT 1	PAC	12/08/2003	13:31			8	30105 43979	OSGB
ERT 1	PAC	12/08/2003	13:51			9	30049 44161	OSGB
ERT 1	PAC	12/08/2003	14:00			10	30021 44180	OSGB
ERT 1	PAC	12/08/2003	14:13			11	29963 44215	OSGB
ERT 1	PAC	12/08/2003	14:24			12	29938 44263	OSGB
ERT 1	PAC	12/08/2003	14:37			13	29852 44355	OSGB
ERT 1	PAC	12/08/2003	14:50			14	29886 44308	OSGB
ERT 1	PAC	12/08/2003	15:01			15	29815 44198	OSGB
ERT 1	PAC	12/08/2003	15:18			16	29844 43985	OSGB
ERT 2	JPH	12/08/2003	11:19	G2		1	29924 43725	OSGB
ERT 2	JPH	12/08/2003	11:36	G2	1	2	30012 43727	OSGB
ERT 2	JPH	12/08/2003	11:49	G2	1	3	30016 43667	OSGB
ERT 2	JPH	12/08/2003	12:04	G2	3	4	29996 43689	OSGB
ERT 2	JPH	12/08/2003	12:18	G2		5	29987 43684	OSGB
ERT 2	JPH	12/08/2003	12:22	G2		6	29973 43676	OSGB
ERT 2	JPH	12/08/2003	12:29	G2		7	30000 43655	OSGB
ERT 2	JPH	12/08/2003	12:38	G2		8	29978 43635	OSGB
ERT 2	JPH	12/08/2003	12:55	G2		9	29945 43605	OSGB
ERT 2	JPH	12/08/2003	13:07	G2	8/9	10	29935 43616	OSGB
ERT 2	JPH	12/08/2003	13:26	G2		11	29757 43653	OSGB
ERT 2	JPH	12/08/2003	13:38	G2		12	29679 43744	OSGB
ERT 2	JPH	12/08/2003	13:49	G2	10	13	29685 43698	OSGB
ERT 2	JPH	12/08/2003	14:05	G2	12	14	29667 43707	OSGB
ERT 2	JPH	12/08/2003	14:28	G2		15	29543 43483	OSGB
ERT 2	JPH	12/08/2003	15:12	G2		16	29645 44000	OSGB
ERT 2	JPH	12/08/2003	15:27	G2		17	29700 43847	OSGB

Pair or team	Surveyor	Date	Time	Map no	Field Poly ID	Waypoint no	Position (OS grid)	Datum
ERT 1	PAC	13/08/2003	12:00		1 (start)	1	27815 42766	OSGB
ERT 1	PAC	13/08/2003	12:15		1/2	2	27850 42735	OSGB
ERT 1	PAC	13/08/2003	12:27		2/3	3	27863 42715	OSGB
ERT 1	PAC	13/08/2003	12:50		3 (end)	4	27867 42699	OSGB
ERT 1	PAC	13/08/2003	13:09			5	27812 42669	OSGB
ERT 1	PAC	13/08/2003	13:24		7	6	27788 42671	OSGB
ERT 1	PAC	13/08/2003	13:54		9	7	27651 42739	OSGB
ERT 1	PAC	13/08/2003	14:26		12	8	27832 42827	OSGB
ERT 1	PAC	13/08/2003	14:45		14/gully	9	27864 42872	OSGB
ERT 1	PAC	13/08/2003	15:21		13 (1)	10	27981 43013	OSGB
ERT 1	PAC	13/08/2003	15:35		13 (1)	11	28035 43082	OSGB
ERT 1	PAC	13/08/2003	15:49			12	28005 43014	OSGB
ERT 1	PAC	13/08/2003	16:06		15	13	28080 43069	OSGB
ERT 1	PAC	13/08/2003	16:20		16	14	28114 43002	OSGB
ERT 1	PAC	13/08/2003				15	28016 42957	OSGB
ERT 2	JPH	13/08/2003	11:51	E		1	28545 43371	OSGB
ERT 2	JPH	13/08/2003	12:16	E		2	28575 43350	OSGB
ERT 2	JPH	13/08/2003	12:35	E		3	28568 43344	OSGB
ERT 2	JPH	13/08/2003	12:50	E		4	28556 43313	OSGB
ERT 2	JPH	13/08/2003	13:20	E		5	28540 43256	OSGB
ERT 2	JPH	13/08/2003	13:47	E		6	28449 43116	OSGB
ERT 2	JPH	13/08/2003	14:14	E	8	7	28489 43364	OSGB
ERT 2	JPH	13/08/2003	14:32	E	8	8	28447 43433	OSGB
ERT 2	JPH	13/08/2003	14:47	E		9	28498 43517	OSGB
ERT 2	JPH	13/08/2003	14:57	E		10	28595 43505	OSGB
ERT 2	JPH	13/08/2003	15:07	E		11	28663 43514	OSGB
ERT 1	PAC	14/08/2003	12:20	B		1	28021 42579	OSGB
ERT 1	PAC	14/08/2003		B		2	28008 42659	OSGB
ERT 1	PAC	14/08/2003		B		3		OSGB
ERT 1	PAC	14/08/2003	13:03	B	2/4	4	28037 42696	OSGB
ERT 1	PAC	14/08/2003	14:20	B	9	5	28210 42046	OSGB
ERT 1	PAC	14/08/2003	14:35	B	9	6	28133 41948	OSGB
ERT 1	PAC	14/08/2003	14:43	B	11	7	28115 41922	OSGB
ERT 1	PAC	14/08/2003	14:57	B	2B	8	28092 41887	OSGB
ERT 1	PAC	14/08/2003	15:15	B	9	9	28008 41801	OSGB

Pair or team	Surveyor	Date	Time	Map no	Field Poly ID	Waypoint no	Position (OS grid)	Datum
ERT 1	PAC	14/08/2003	16:06	B	top of hill	10	27781 41659	OSGB
ERT 1	PAC	14/08/2003	16:20	B	lower wpt	11	27793 41560	OSGB
ERT 2	JPH	14/08/2003	12:17	A	1	1	27715 41209	OSGB
ERT 2	JPH	14/08/2003	12:41	A	TG1	2	27748 41191	OSGB
ERT 2	JPH	14/08/2003	13:06	A	5	3	27767 41179	OSGB
ERT 2	JPH	14/08/2003	13:16	A	6	4	27766 41169	OSGB
ERT 2	JPH	14/08/2003	13:34	A	7/8	5	27784 41130	OSGB
ERT 2	JPH	14/08/2003	14:08	A	cliff	6	27711 41232	OSGB
ERT 2	JPH	14/08/2003	14:20	A	cliff	7	27768 41132	OSGB
ERT 2	JPH	14/08/2003	14:30	A	cliff	8	27651 41102	OSGB
ERT 2	JPH	14/08/2003	14:41	A	cliff	9	27505 41136	OSGB
ERT 2	JPH	14/08/2003		A	cliff	10		OSGB
ERT 2	JPH	14/08/2003	14:48	A	cliff	11	27565 41046	OSGB
ERT 2	JPH	14/08/2003	14:58	A	cliff	12	27398 41105	OSGB
ERT 2	JPH	14/08/2003	15:10	A	cliff	13	27391 40959	OSGB
ERT 2	JPH	14/08/2003	15:20	A	cliff	14	27329 40900	OSGB
ERT 2	JPH	14/08/2003	15:30	A	cliff	15	27273 40859	OSGB
ERT 2	JPH	14/08/2003	15:45	A	cliff	16	27226 40893	OSGB
ERT 2	JPH	14/08/2003	16:04	A	cliff	17	27129 40977	OSGB
ERT 2	JPH	14/08/2003	16:35	A	cliff	18	27731 41355	OSGB
ERT 1	PAC	15/08/2003	11:59	B	1	1	27616 41549	OSGB
ERT 1	PAC	15/08/2003	13:13	B	2	2	27511 41781	OSGB
ERT 1	PAC	15/08/2003	13:29	B		3	27597 41891	OSGB
ERT 1	PAC	15/08/2003	13:49	B		4	27591 41845	OSGB
ERT 1	PAC	15/08/2003	14:11	B		5	27590 42080	OSGB
ERT 1	PAC	15/08/2003	14:26	B		6	27776 42245	OSGB
ERT 1	PAC	15/08/2003	14:49	B		7	27911 42411	OSGB
ERT 1	PAC	15/08/2003	15:50	C/E		8	28209 43820	OSGB
ERT 2	JPH	15/08/2003	11:48	A		1	27043 40826	OSGB
ERT 2	JPH	15/08/2003	12:08	A	17	2	27036 40851	OSGB
ERT 2	JPH	15/08/2003	12:44	A		3	27124 41052	OSGB
ERT 2	JPH	15/08/2003	14:00	A		4	27129 41002	OSGB
ERT 2	JPH	15/08/2003	14:29	A		5	27279 41219	OSGB
ERT 2	JPH	15/08/2003	14:35	A		6	27320 41199	OSGB
ERT 2	JPH	15/08/2003	14:45	A		7	27295 41226	OSGB
ERT 2	JPH	15/08/2003	15:08	A		8	27341 41242	OSGB

Pair or team	Surveyor	Date	Time	Map no	Field Poly ID	Waypoint no	Position (OS grid)	Datum
ERT 2	JPH	15/08/2003	15:14	A		9	27436 41241	OSGB
ERT 2	JPH	15/08/2003	15:24	A		10	27509 41360	OSGB
ERT 2	JPH	15/08/2003	15:26	A		11	27452 41405	OSGB
ERT 2	JPH	15/08/2003	15:38	A		12	27512 41433	OSGB
ERT 2	JPH	15/08/2003	15:44	A		13	27604 41439	OSGB
ERT 2	JPH	15/08/2003	15:48	A		14	27509 41519	OSGB
ERT 2	JPH	15/08/2003	15:54	A		15	27544 41540	OSGB
ERT 1	PAC	16/08/2003	12:54	D	Y/G	1	28894 42803	OSGB
ERT 1	PAC	16/08/2003	14:02	D	F.ser ser	2	28827 42599	OSGB
ERT 1	PAC	16/08/2003	14:08	D		3	28854 42566	OSGB
ERT 1	PAC	16/08/2003	14:15	D		4	28831 42495	OSGB
ERT 1	PAC	16/08/2003	14:30	D		5	28827 42451	OSGB
ERT 1	PAC	16/08/2003	14:50	D	F.ser	6	28706 42795	OSGB
ERT 1	PAC	16/08/2003	15:00	D	F.ser	7	28638 42862	OSGB
ERT 1	PAC	16/08/2003	15:05	D	F.ser	8	28588 42888	OSGB
ERT 1	PAC	16/08/2003	15:35	?		9	28967 43215	OSGB
ERT 1	PAC	16/08/2003	15:46	F	L. dig	10	29108 42707	OSGB
ERT 1	PAC	16/08/2003	16:02		V.muc	11	29221 43306	OSGB
ERT 1		16/08/2003	16:09		V.muc	12	29089 43260	OSGB
ERT 1		16/08/2003	16:17			13	29786 42842	OSGB
ERT 1	JPH	16/08/2003	16:47	D		14	28693 42170	OSGB
ERT 1	JPH	16/08/2003	16:54	D		15	28796 41987	OSGB
ERT 1	JPH	16/08/2003	16:59	D		16	28871 41960	OSGB
ERT 1	JPH	16/08/2003	17:02	D		17	28820 41791	OSGB
ERT 2	JPH	16/08/2003	13:02	H	1	1	29005 43881	OSGB
ERT 2	JPH	16/08/2003	13:18		4	2	29029 43911	OSGB
ERT 2	JPH	16/08/2003	13:47			3	28942 43912	OSGB
ERT 2	JPH	16/08/2003	14:28	H	7	4	29004 43806	OSGB
ERT 2	JPH	16/08/2003	14:38			5	29014 43821	OSGB
ERT 2	JPH	16/08/2003	14:59		9	6	29055 43870	OSGB
ERT 2	JPH	16/08/2003	15:50		12	7	28807 43283	OSGB




**Appendix 4 – Target note log from intertidal survey, Treshnish Isles biotope mapping survey, August 2003**

Surveyor	Team	Date	Map no	Field poly ID	Target ID	Target note
IMTD, PAC	1	11/08/2003	I	N/A	1	Transect 1, Cairn na Burgh Beg (north)
IMTD, PAC	1	11/08/2003	I	N/A	2	Transect 2, Cairn na Burgh Beg (south)
IMTD, PAC	1	11/08/2003	I	N/A	3	Arch through stack on west side
BJ, JPH	2	11/08/2003	I	N/A	1	Profile of transect 1
PAC	1	12/08/2003		1-4	1	Team 1, transect 1 (wpt 1 at waters edge to wpt 4 at top of shore. Border edge of polygon ID 3/4 (30048 43711).
PAC	1	12/08/2003			2	End of gully on northwest of Island (wpt 16; 29844 43985).
BJ/JH/AC	2	12/08/2003	G(ii)	1	1	Wpt 2 - Guano-covered rocks. Photos 77+78 on NE edge of poly 1
BJ/JH/AC	2	12/08/2003	G(ii)	N/A	2	Wpt 7 - Profile of vertical rock. See profile picture 1 photo 84
BJ/JH/AC	2	12/08/2003	G(ii)	6	3	Wpt 5 - Boulders covered in Enteromorpha (90%), <i>F. vesiculosus</i> (40%), <i>S. balanoides</i>
BJ/JH/AC	2	12/08/2003	G(ii)	10	4	Wpt 13 - Centre of run off channel-polygon 10 all round - channel full of Lit shells, Ectocarpus, <i>L. littorea</i> , lots of hermit crabs. Fresh water and sea water runoff, <i>F.serr</i> , Mastocarpus, Ulva/Enteromorpha, shell gravel with cobbles, pebbles and boulders, shrimps enc. coralline alga. Patella, <i>S. balanoides</i> on rock surface, <i>L. obtusata</i> , Ceramium.
BJ/JH/AC	2	12/08/2003	G(ii)	11	5	Wpt 14 - Fser.X biotope area in southern "Inlet" area
PAC	1	13/08/2003	C	1	1	Start of transect 1 at base of cliff in YG zone
PAC	1	13/08/2003	C	2	2	Wpt 1 (27815 42766)
PAC	1	13/08/2003	C	3	3	End to transect 1 at waters edge wpt 4 (27867 42699)
PAC	1	13/08/2003	C	7	4	Gully wpt 6
PAC	1	13/08/2003	C		5	Rock pool wpt 8
PAC	1	13/08/2003	C	13 (1)	6	Cave entrance at wpt 10
BJ/JH/AC	2	13/08/2003	E	4+5	1	Wpt 3 - Under boulder communities. Sponges, algal mats, anemones. Photo 130
BJ/JH/AC	2	13/08/2003	E	8	2	Wpt 7 - Green pool. 100% cover of green algae. Photo 146. Pool at head of indented area, with a couple of smaller green pools in the gully and a Cor pool viewed from above.

Surveyor	Team	Date	Map no	Field poly ID	Target ID	Target note
IMTD, PAC	1	14/08/2003	B	2B	1	Cave, wpt 8
IMTD, PAC	1	14/08/2003	B	2B	2	Occurrence of Ala.Ldig biotope within <i>L. dig</i> (in polygon 5F), wpt 7
BJ/JH/AC	2	14/08/2003	A	3/4	1	Under boulder community, large numbers of Actinia, Nucella, orange encrusting sponge, <i>L. littorea</i> , <i>L. saxatilis</i> , Patella, Spirorbids, <i>S. balanoides</i> , Chiton, encrusting coralline alga, scale worm, <i>Halichondria</i> sp, Mastocarpus, red turf, Gelidium sp, Enteromorpha. Wpt 2, Photos 175-176
BJ/JH/AC	2	14/08/2003	A	3/4	2	Indication of area of Id 4 and 5 of rock pools. FK and some cor

## Appendix 5 – Annex contents (annex supplied separately)

- **Aerial photography**
  - Transparencies;
    1. S1, 5 frames
    2. A1, 12 frames
    3. B1, 12 frames
    4. C1, 12 frames
    5. D1, 5 frames
    6. A2, 12 frames
    7. B2, 11 frames
    8. C2, 9 frames
    9. D2, 6 frames
  - Scanned data on 3 CDs
    1. Scanned aerial imagery, individual tiles as JPEGs;
    2. Mosaic of tiles as a JPEG file
    3. Mosaic of tiles as original Photoshop 7 files
- **Sublittoral Survey**
  - Survey report
  - Raw AGDS data and ground truth positions on 1 CD
  - Ground truth video data on 3 mini DV tapes
- **Littoral survey**
  - Survey log and summary of mapping progress
  - Neat maps
  - Master biotope list
  - Specimens taken and confirmed identity
  - Daily records and forms for the two field teams
  - Photographs and GPS data on 1 CD



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- Helping to address climate change
- Delivering health and well being
- Supporting the Scottish economy
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Policy and Advice Directorate,  
Great Glen House,  
Leachkin Road,  
Inverness IV3 8NW  
[www.snh.org.uk](http://www.snh.org.uk)



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