Natural England Research Report NERR059

Isles of Scilly SAC: Intertidal Under-Boulder Communities Survey 2011

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Executive Summary

This report presents a monitoring survey into the range of species found within the Isles of Scilly 'Rocky shore communities' which is a sub-feature of the Special Area of Conservation (SAC), representing the intertidal regions of the 'Reef' feature. This includes the Biodiversity Framework (BAP) habitat 'Intertidal under-boulder communities'. The objective was to survey intertidal rocky shore habitats below Mean Low Water (MLW), analyse biological samples to their lowest practical taxonomic level (in the field), identify biotope characteristics and establish a baseline and methodology for future monitoring. The survey also recorded the continued presence of rare species – some only recorded at the Isles of Scilly in the UK – and the presence of non-native species which may proliferate and compete with native species.

Some of the locations had previous records from surveys by local marine conservation enthusiasts and professionals, providing a baseline on species that were present in previous years.

Surveying of intertidal under-boulder habitats over 13 sites within the Isles of Scilly SAC was carried out in September 2011. Phase 1 and phase 2 surveys of the sites were undertaken to characterise the reef below MLW with randomly placed quadrats used for a more detailed study within the under-boulder zone. In addition, phase 1 and 2 surveys of the wider shore area were also undertaken to put the detailed results into context and allow monitoring of broader changes in the future.

The survey methodologies employed have been recorded and descriptions of each site, including the abundance and distribution of organisms, are provided along with survey site and designation maps.

The surveys showed the continued presence of healthy and diverse intertidal under-boulder communities, with rare and nationally scarce species confirmed as present. There were very limited sightings of non-native species, and although the species richness at one site appeared to be reduced, this was considered to be natural variation or variation in survey effort. The under-boulder community biotope, which represents a notable community within the 'Reef' feature of the SAC, was considered to be in favourable condition.

Background

The Isles of Scilly lie 28 miles off the south-western tip of Cornwall; and with over 200 low-lying granite islands and rocks they represent England's only oceanic archipelago. The marine environment of the Isles of Scilly is ecologically important because it is species rich and contains fragile and unusual biotopes which include rare and fragile species. A recent study found 62.3% of residents surveyed enjoy knowing that the future generations will be able to enjoy marine biodiversity of this region, and over 50% believe it is important to the local economy (RessurreiÇão and others, 2012).

The Isles of Scilly and the surrounding marine environment were designated an Area of Outstanding Natural Beauty (AONB) and, from mean low water (MLW) seaward, the Isles of Scilly's marine environment has been designated a marine Special Area of Conservation (SAC) since 2000 (JNCC website, [accessed 2013]). Eleven sites within the Isles of Scilly were also proposed as a Marine Conservation Zone (MCZ) in 2011, and were designated in November 2013. This collection of sites protects additional areas of intertidal habitat, as well as stalked jellyfish *Lucernariopsis cruxmelitensis* and *Haliclystus auricula* which can be found in the intertidal area. Intertidal under-boulder communites are a protected feature at six of the eleven sites of the designated Marine Conservation Zone as they provide a habitat for mixed sponges, bryozoans and anemones as well as small crabs and sea squirts.

Under-boulder habitats can occur on a variety of substrata, but the Biodiversity Framework (BAP) habitat 'Intertidal under-boulder communities' occurs only where large stable boulders have a sufficient gap on the underside to support an under-boulder community (JNCC, 2008). In the Isles of Scilly the under-boulder habitat occurs from the mid-shore to the extreme lower shore; and can be

found on shores which are sheltered or moderately exposed (Gall, 2011). Although boulders are widespread around Britain's coast, only a small percentage of these support diverse under-boulder communities; with very few creating ideal conditions for sensitive species such as the nationally rare bulbous encrusting bryozoan *Turbicellepora magnicostata;* which within the UK has only been recorded as present in the Isles of Scilly, and therefore is noteworthy even if the percentage cover is low (Hughes, 2002).

The boulder shores in the Isles of Scilly contain an array of fissures, crevices, rockpools, rockmills, boulder holes and granite boulders that range in size from around 26cm in diameter to several metres across. The presence of boulders can lead to local modification of the shore, affecting wave exposure, current strength and the volume of trapped organic matter. Such alteration of the physical environment facilitates an increase in biodiversity that extends beyond the immediate proximity of the boulders themselves, and enables species that are sensitive to exposure to proliferate. By providing protection from sunlight, wave action, predation and other stress factors, boulders create microhabitats that support under-boulder communities and give shelter to the eggs of fish, dog whelks, sea slugs etc., and provide refuge for mobile marine life such as crabs and fish. In this way boulders create an environment that facilitates the development of diverse communities in areas which might otherwise be exposed, hostile and species poor (JNCC 2008).

The primary aim of this monitoring study was to assess the biodiversity and condition of the intertidal rockyshore communities below MLW, which are a sub-feature of the Reef component of the SAC, and also to provide a stronger evidence base for the MCZ feature for designation and future management objectives.

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1 Introduction

1.1 The European Union's Habitats Directive was adopted in 1992 and was transposed into UK law by the Habitats Regulations 1994[1]. A primary requirement of the habitats directive is the selection of a series of sites known as Special Areas of Conservation (SAC), which are the best examples in Europe of a suite of habitats listed in the Directive. The Isles of Scilly were selected as a SAC due to their rich infaunal communities of intertidal and subtidal marine sediments.

Qualifying habitats in the Isles of Scilly SAC (as listed in Annex I)

- **Sandbanks which are slightly covered by sea water all the time (Subtidal sandbanks)** - there are rich communities present on the tide-swept sandbanks in the narrow channels between the islands and in the deeper, more stable, wave-sheltered sediments. The fauna of these sediments includes tanaid crustaceans, a diversity of polychaete worms, and various echinoderms. The shallow sublittoral sediments are colonised by the most extensive and best-developed eelgrass *Zostera marina* beds in southern England (Hocking & Tompsett 2002).
- **Intertidal mudflats and sandflats not covered by seawater at low tide (Intertidal mudflats and sandflats)** - the Isles of Scilly archipelago supports extensive areas of undisturbed intertidal sandflats in the extreme south-west of the UK. The islands are particularly important for exceptionally rich communities occurring in coarse sediments, including clean sand, a substrate that is usually poor in species. The sandflats exposed at low tide between the northern islands are of international marine nature conservation importance, owing to their extent and diversity and the presence of species rarely found elsewhere in the intertidal. The lower shore sandflats include the fringes of the extensive beds of eelgrass *Zostera marina* (Hocking & Tompsett 2002), and includes rich sediment communities of anemones, polychaete worms, bivalve molluscs and burrowing echinoderms.
- **Reefs (post-moderation feature)** - the location of the islands, exposed to the full force of the Atlantic, leads to the development of extremely exposed communities on west-facing reefs, whilst on the east-facing coast, more sheltered and silted reefs occur. The south-westerly position of the islands leads to a range of warm-water species being present, including sunset cup-coral *Leptopsammia pruvoti*, pink sea-fans *Eunicella verrucosa*, and Weymouth carpet-coral *Hoplangia durotrix*.

Qualifying species in the Isles of Scilly SAC (under Annex II)

- Shore dock Rumex rupestris
- Grey seal Halichoerus grypus

1.2 Among the reasons for the site's designation, under article 4(4) of the Directive (92/43/EEC), was the high species richness of its reef habitats, as listed in Annex 1. Intertidal under-boulder communities are listed among the attributes of 'rocky shore communities' which are a sub-feature of the nationally important 'Reefs, Natura Code 1170'. In order to ensure that the features protected by the SAC are being conserved, there is a requirement to undertake monitoring of the

[1] Now administered through the Conservation of Habitats and Species Regulations 2010 (as amended 2012)
http://www.legislation.gov.uk/uksi/2010/490/pdfs/uksi_20100490_en.pdf
http://www.legislation.gov.uk/uksi/2012/1927/contents/made

site at least every six years. The results of monitoring will then be used to inform managers of the site as to any changes that may need to be made.

1.3 The objectives of this study were to establish a baseline for future monitoring of intertidal under-boulder zones that had not yet been surveyed; to repeat surveys of previously surveyed sites; to analyse the biological samples to the lowest practical taxonomic level; to compare the resulting data to determine similarities and differences between surveys; and to produce an assessment of the internationally important 'Intertidal under-boulder communities' Biodiversity Framework (BAP)[2] habitat as part of the European Marine Sites (EMS) monitoring programme.

Isles of Scilly Marine Conservation Zone (MCZ) Sites

1.4 The species records and survey work carried out in this study also had a dual role in assessing baseline condition for the recommended MCZ sites within the Isles of Scilly.

1.5 Six of the survey sites selected fell within the recommended Isles of Scilly MCZ sites, which were designated in 2013 under the Marine and Coastal Access Act 2009[3] to contribute to a coherent network of marine protected areas. Further details on the sites and features within the Isles of Scilly MCZ are available from the factsheet **here** (DEFRA, 2013) and a detailed map is within Appendix 4.

1.6 The Intertidal Under-boulder Communites were a recommended protected feature of the MCZ at the following sites surveryed here:

1) English Island point – within Higher Town area of the MCZ
2) Toll Island South – within Peninnis to Dry Ledge area of the MCZ
3) Pelistry Bay – within Peninnis to Dry Ledge area of the MCZ
4) Old Town Bay East side – within Peninnis to Dry Ledge area of the MCZ
5) Old Town Bay West side – within Peninnis to Dry Ledge area of the MCZ
6) Wingletang Bay – within Plympton to Spanish Ledge area of the MCZ

1.7 This survey work provided a baseline for maintaining the Intertidal Under-boulder Communites in favourable condition, with a healthy biodiverse range of sponges, algae, bryzoans and anthozoans typical of the biotope.

1.8 The intertidal under-boulder community habitat occurs from mid-shore to the extreme lower shore and includes the biotopes '*Fucus serratus* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders' LR.MLR.BF.Fser.Bo (EUNIS code A1.2142). The habitat also includes the biotope '*Laminaria digitata*' and 'under-boulder fauna on sub-littoral fringe boulders' IR.MIR.KR.Ldig.Bo (EUNIS code A3.2112) (BRIG, 2008). Both biotopes are present in the Isles of Scilly; however this assessment does not include the latter as the sub-littoral fringe was not within the focus of study.

[2] In 2012 the UK BAP lists were superceded by the UK Post-2010 Biodiversity Framework but the term 'BAP' species is still used colloquially (JNCC and DEFRA, 2012). The list of BAP priority species & habitats can be found here: Species - **http://jncc.defra.gov.uk/page-5167** Habitats - **http://jncc.defra.gov.uk/page-5706**

[3] **http://www.legislation.gov.uk/ukpga/2009/23/contents**

Box 1: JNCC Biotope description LR.MLR.BF.Fser.Bo (EUNIS Code A1.2142)

Fucus serratus and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders.

Exposed to moderately exposed lower eulittoral boulders with the wrack *Fucus serratus* community of a high species richness as the presence of the boulders increases the micro-habitat diversity. The upper surfaces of the boulders are colonised by a very similar fauna to the other *F. serratus* biotopes, including species such as the limpet *Patella vulgata*, the whelk *Nucella lapillus,* the anemone *Actinia equina* and the barnacle *Semibalanus balanoides*. The shaded sides of the boulders are, depending on environmental conditions, often colonised by a variety of foliose red seaweeds, including *Mastocarpus stellatus*, *Lomentaria articulata*, *Osmundea pinnatifida, Palmaria palmata* and *Chondrus crispus*. Coralline algae such as the *Corallina officinalis* and coraline crusts as well as the green seaweeds *Ulva intestinalis* and *Ulva lactuca* can be found underneath the *F. serratus* canopy or in patches on the boulders. The species composition underneath the boulders varies considerably depending on the underlying substratum. On muddy shores the fauna living under the boulders may be limited to a few infaunal species, such as the polychaete *Cirratulus cirratus*. Where more space is available beneath the boulders there may be a rich assemblage of animals. Characteristic mobile species include the crabs *Porcellana platycheles* and *Carcinus maenas*. Also present on and beneath the boulders are the tube-forming polychaete *Spirobranchus triqueter*, spirorbid polychaetes and a few winkles such as *Littorina obtusata/fabalis* and *Littorina littorea* or even the top shell *Gibbula cineraria.* Encrusting colonies of the sponge *Halichondria panicea* are also typical of the undersides of boulders, while the hydroid *Dynamena pumila* colonies can be found on the *F. serratus* fronds. The richest examples of this biotope also contain a variety of brittlestars, ascidians and small hydroids. (BRIG, 2008).

1.9 In the Isles of Scilly the LR.MLR.BF.Fser.Bo biotope is often characterised by *Himanthalia elongata* rather than *Fucus serratus,* the encrusting bryozoans *Turbicellepora magnicostata* is a characterising species and the periwinkle *Littorina littorea* is notably absent.

Box 2: JNCC Biotope description IR.MIR.KR.Ldig.Bo (EUNIS Code A3.2112)

The *Laminaria digitata* biotope is found predominantly on moderately exposed boulder shores and occasionally also on exposed or sheltered shores. Upper surfaces of the boulders are colonised by dense *L. digitata* though other kelp such as *Laminaria hyperborea* and *Laminaria saccharina* or the wrack *Fucus serratus* can be present at lower abundance. The kelp fronds can be colonised by the bryozoans *Membranipora membrana*cea. Beneath the kelp canopy are a variety of red seaweeds such as *Mastocarpus stellatus, Chondrus crispus, Palmaria palmata, Membranoptera alata, Corallina officinali*s and coralline crusts. Green seaweeds include *Cladophora rupestris* and *Ulva lactuca*. Where space is available beneath the boulders (i.e. they are not buried in sediment) there may be a rich assemblage of animals. Characteristic species include the crabs *Porcellana platycheles, Pisidia longicornis* and juvenile *Cancer pagurus*. Also present beneath the boulders are often high densities of the barnacle *Balanus crenatus*, the tube-building polychaete *Spirobranchus triqueter*, spirorbid worms, the polychaete *Harmothoe sp.,* gammarid amphipods and a few gastropods such as *Gibbula cineraria*. The encrusting bryozoans *Electra pilosa* and *Oshurkovia littoralis* and encrusting colonies of the sponges *Halichondria panicea* and *Halisarca dujardini* are also typical of this habitat. The richest examples also contain a variety of echinoderms such as *Asterias rubens*, colonial ascidians such as *Botryllus schlosseri* and small hydroids (BRIG, 2008).

1.10 In addition to the variation in the LR.MLR.BF.Fser.Bo biotope other major differences exist between the shore communities of the Isles of Scilly and those of the nearby mainland coasts. These include the almost complete absence of the barnacle *Semibalanus balanoides* and the non-native barnacle *Austrominius modestus* (formerly known as *Elminius modestus*[4]) (Gall, 2011). The limpet *Patella depressa,* the mussel *Mytilus edulis* and the periwinkle *Littorina littorea* are all notably absent (Crisp and Southward, 1958). Other species are more abundant in the Isles of Scilly than they are elsewhere including the seaweeds *Bifurcaria bifurcata, Cystoseira tamariscifolia* and the pink encrusting algae *Mesophyllum lichenoides* (Gall, 2011). The topshell *Phorcus lineatus* (formerly known as *Osilinus lineatus*[5]) and the anemone *Anthopleura ballii* are also much more common in the Isles of Scilly than they are elsewhere (Hiscock, 1984). During the course of this monitoring programme it was found that the previously recorded variations in community composition between the mainland and the Isles of Scilly persisted.

[4] **http://www.marinespecies.org/aphia.php?p=taxdetails&id=106209**

[5] **http://www.marinespecies.org/aphia.php?p=taxdetails&id=141827**

2 Methodology

2.1 Historical records and local knowledge enabled the selection of sites for their rich habitats; their representative example of intertidal under-boulder communities; and wherever possible, their overlap with the recommended Marine Conservation Zone (MCZ) sites.

2.2 Surveys took place at the following locations, with comparisons made to previous intertidal survey records where possible.

Table 1 Survey site locations and previous studies

Survey Site name	OS Grid reference	Previous surveys
St Agnes Periglis, Burnt Island	SV 87526 08424	Shoresearch 2010
St Agnes Wingletang Bay	SV 88391 07343	Shoresearch 2010
Gugh, Dropnose Porth	SV 98242 08280	Shoresearch 2010
St Mary's Toll's Island, north side	SV 92974 12042	2009 Isles of Scilly Marine Biodiversity Project (Shoresearch)
St Mary's Toll's Island, south side	SV 93067 11884	Previously unsurveyed
St Mary's Pelistry Bay	SV 92922 11825	2009 Isles of Scilly Marine Biodiversity Project (Shoresearch)
St Mary's Old Town Bay, east side	SV 91387 10093	2009 Isles of Scilly Marine Biodiversity Project (Shoresearch)
St. Mary's Old Town Bay, west side	SV 91271 09995	Previously unsurveyed
St Mary's Porth Loo	SV 90826 11463	2009 Isles of Scilly Marine Biodiversity Project (Shoresearch)
Tresco Appletree Point	SV 88851 14182	Shoresearch 2010
Tresco Plumb Island	SV 88632 14875	2009 Isles of Scilly Marine Biodiversity Project (Shoresearch)
St Martin's English Island Point	SV 93770 15222	1984 JNCC, 2010 Shoresearch, 2010 Porcupine Marine Natural History Society
St. Martin's St Lawrence's Bay	SV 92480 15649	Previously unsurveyed

2.3 An outline of the survey plan and a Risk Assessment were prepared and distributed to all the surveyors in advance of the survey. The survey period ran from 26th September to 1st October 2011 during six days of spring low tides. The surveys were conducted by a team of nine

surveyors, and were carried out in groups of two or three, with each group including one of the more experienced surveyors in the survey team.

2.4 The methods used were based on methods developed through the Marine Nature Conservation Review and described in the JNCC Marine monitoring handbook [6](Davies and others, 2001).

2.5 To help ensure quality control and to reduce surveyor bias a familiarisation day was held at the start of the survey to make surveyors familiar with local conditions, species and biotope peculiarities.

2.6 Surveys of the wider shore area above and below MLW were undertaken (along a transect) at each site. This information was recorded on standard Marine Nature Conservation Review (MNCR) Site Information and detailed Littoral Habitat forms.

2.7 For each zone the abundance of all observed species was recorded using the SACFOR scale:

- S – Super abundant
- A – Abundant
- C – Common
- F – Frequent
- O – Occasional
- R – Rare

2.8 The survey plan was flexible as the extent of the survey was, to some degree, dependent on survey conditions. In addition to the phase 1 and 2 surveys the aim was to conduct detailed quadrat surveys of the under-boulder communities. The target was to survey five 0.5m^2 quadrats at each site; however this was not achieved at every site due to tide and time constraints. At Old Town West, Old Town East, Porth Loo and Toll's Island South 2, 4, 4, and 4 quadrats were surveyed respectively.

2.9 The focus of this survey was the under-boulder zone below the MLW where the quadrat methodology was employed. Quadrats were distributed using randomly generated compass bearings and distances radiating from a fixed central point within the intertidal under-boulder zone. All visible organisms observed living within each quadrat were listed and the numbers of each species counted; if too numerous, an estimate or the percentage of the quadrat that they occupied was given.

2.10 Species were identified using the most recent peer reviewed keys and literature available. Anything that could not be identified *in situ* was sampled and stored in seawater for later identification and examined under a binocular microscope when necessary. Organisms were identified to species level wherever possible, but when there was uncertainty organisms were identified to the lowest practical taxonomic level.

2.11 Digital photographs were taken to capture a visual record of biotopes, community features and specific species.

2.12 The survey was non-destructive and disturbance was kept to a minimum. Following the survey, all data was quality assured, and entered onto Marine Recorder.

[6] **http://jncc.defra.gov.uk/PDF/MMH-Pg%203-2.pdf** & **http://jncc.defra.gov.uk/PDF/MMH-Pg%203-1.pdf**

3 Site descriptions

St Agnes

Periglis, Burnt Island (OS grid ref. SV 87526 08424)

3.1 Burnt Island, located in north-west St Agnes, is situated within the SAC and AONB.

3.2 The upper shore of this moderately exposed, south-east facing embayment is gently sloping and dotted with numerous small pools.

3.3 Supralittoral yellow and green lichens, including *Ramalina sp.,* on large boulders led in to a band of black tar lichen *Verrucaria maura* that merged with sparse *Fucus spiralis* and typical upper eulittoral grazing communities.

3.4 In the mid eulittoral zone the substrata is made up of pebbles, cobbles and small to large boulders in equal measure; whilst on the lower shore large boulders predominate with only a small percentage of small boulders, cobbles, pebbles and sand.

3.5 Small pools and a high percentage of boulders, upon which the common limpet *Patella vulgata* was abundant, were present throughout the mid eulittoral zone. This zone also contained a very broad band of *Fucus vesiculosus,* recorded as common with spirobids and flat top shells *Gibbula umbilicalis,* and frequent beadlet anemones *Actinia equina.*

3.6 The lower shore dropped off more steeply in the under-boulder zone and was dominated by abundant thongweed *Himanthalia elongata*. Underneath the canopy of *H. elongtata* the green seaweed *Ulva spp.* was found to be common, with high abundance levels in some areas possibly indicating localised disturbance. Numerous foliose red algae were also present, including *Chondracanthus acicularis* which was found to be common with frequent *Chondrus crispus* and *Ceramium* species*.* Pink encrusting coralline algae were common in the understory with frequent filamentous algae *Audouinella sp*. The diverse faunal assemblages in the under-boulder communities within this zone included abundant small spire shells *Rissoa parva;* commonly present spirorbid polychaetes; frequent sponge (porifera) crusts, encrusting ascidians, squat lobsters *Galathea squamifera* and amphipods; as well as occasional edible crabs *Cancer pagurus* and broad-clawed porcelain crabs *Porcellana platycheles,* grey and flat top shells *Gibbula cineraria* and *G. umbillicalis,* as well as the beadlet anemone *A. equina,* snakelocks anemone *Anemonia viridis* and gem anemone *Aulactinia verrucosa.*

ShoreSearch survey report 2010 (Oliver, 2010)

3.7 Burnt Island was surveyed during the week field meeting of the Porcupine Marine Natural History Society. Burnt Island protrudes west from St Agnes and is surrounded by a large area of boulders which becomes covered at high tide. The upper shore is low in biodiversity and dominated by just a few species such as barnacles Chthamalus montagui and black tar lichen *Verrucaria maura*, with occasional periwinkles *Littorina* sp. The middle shore contained a large rockpool, which produced a micro-habitat containing species such as the brown seaweed *Bifurcaria bifurcata*, cushion star *Asterina gibbosa* and the pink encrusting seaweed *Mesophyllum lichenoides* all found during the timed species search (MarLin). The extreme lower shore and sub-tidal habitat is covered in kelp and the rocks underneath are home to a wide variety of organisms including a blue sponge *Terpios fugax*, a small brittle star *Amphipholis squamata* and clingfish *Lepadogaster lepadogaster.*

3.8 No *Terpios fugax, Amphipholis squamata* or *Lepadogaster lepadogaster* were found in the under-boulder zone during the 2011 Natural England survey compared to that of the ShoreSearch survey (Oliver, 2010). It is not possible to make any additional appropriate comparisons between the results of the 2010 ShoreSearch survey and those of Natural England as the Isles of Scilly Marine Biodiversity Project survey report made no further references to the intertidal under-boulder zone.

Wingletang Bay (OS grid ref SV 88391 07343)

3.9 Wingletang Bay, located in south-east St Agnes, just opposite Porth Askin, is situated within the AONB (Area of Outstanding Natural Beauty), SAC and Plympton to Spanish Ledge site of the MCZ.

3.10 This exposed east facing shore is primarily composed of bedrock and boulders with a very small percentage of cobbles, pebbles and coarse sand.

Plate 1 Wingletang bay, showing boulders with Pelvetia canaliculata and lichens

3.11 Supralittoral lichens on boulders in the splash zone led in to the lower littoral fringe, which was characterised by coarse sand and a clear band of channelled wrack *Pelvetia canaliculata* and thick top shell *Phorcus lineatus* that were associated with the large boulders and occasional bedrock outcrops.

3.12 The fucoid brown alga spiral wrack *Fucus spiralis* was abundant in the upper eulittoral zone with occasional red alga *Catenella caespitosa* and green algae *Ulva sp.* with commonly present *Phorcus lineatus.*

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Plate 2 Pelvetia *canaliculata* wrack and thick top shell Phorcus lineatus with Littorina sp.

3.13 Occasional pools are present in the boulder strewn mid eulittoral zone which was characterised by commonly present *Patella vulgata, Gibbula cineraria* and *P. lineatus* with occasional *Nucella lapillus* and a broad mix of red, brown and green algae including frequent *Plumaria plumosa* and occasional *Vertebrata lanosa.*

© Natural England

Plate 3 Spiral wrack Fucus spiralis with Littorina obtusata

3.14 In the under-boulder zone on the lower shore a high diversity of red, brown and green algae were present among the superabundant *Himanthalia elongata.* These include 13 species of red algae, 7 of which were occasionally present and one, *Mastocarpus stellatus,* occurred frequently. The sand binding algae *Audouinella sp.* and *Corallina officinalis* were common in the understory with occasional *Mesophyllum lichenoides* and *Hildenbrandia rubra.*

© Natural England

Plate 4 Boulders with *Fucus sp*. in mid eulittoral zone

3.15 Diverse faunal communities that include spirorbids, *Rissoa parva* and *Patella pellucida* occur frequently with six species of anemone including frequent beadlet anemones *Actinia equina*. The calcareous sponge *Grantia compressa* was frequently present in the understory with other sponges including occasional *Halichondria panacea, Hymeniacidon perlevis*, *Ophlitaspongia papilla* and indeterminate porifera crusts. The ascidians *Aplidium pallidum* and *Aplidium proliferum* were also occasionally present among the intertidal under-boulder communities.

3.16 During the 2010 ShoreSearch survey only 4 species of anemone were found (Oliver, 2010) compared to 7 species found during the 2011 Natural England survey. The strawberry anemone *Actinia fragacea* was present during the ShoreSearch survey but was not recorded by Natural England in 2011; this was also true for the green seaweed *Codium fragile* (although Natural England did record *Codium sp*.).

3.17 As the ShoreSearch report referred only to the anemones and *Codium fragile* at this site, without indication of their relative abundance, it is not possible to make a significant comparison between their survey and the one conducted by Natural England in 2011.

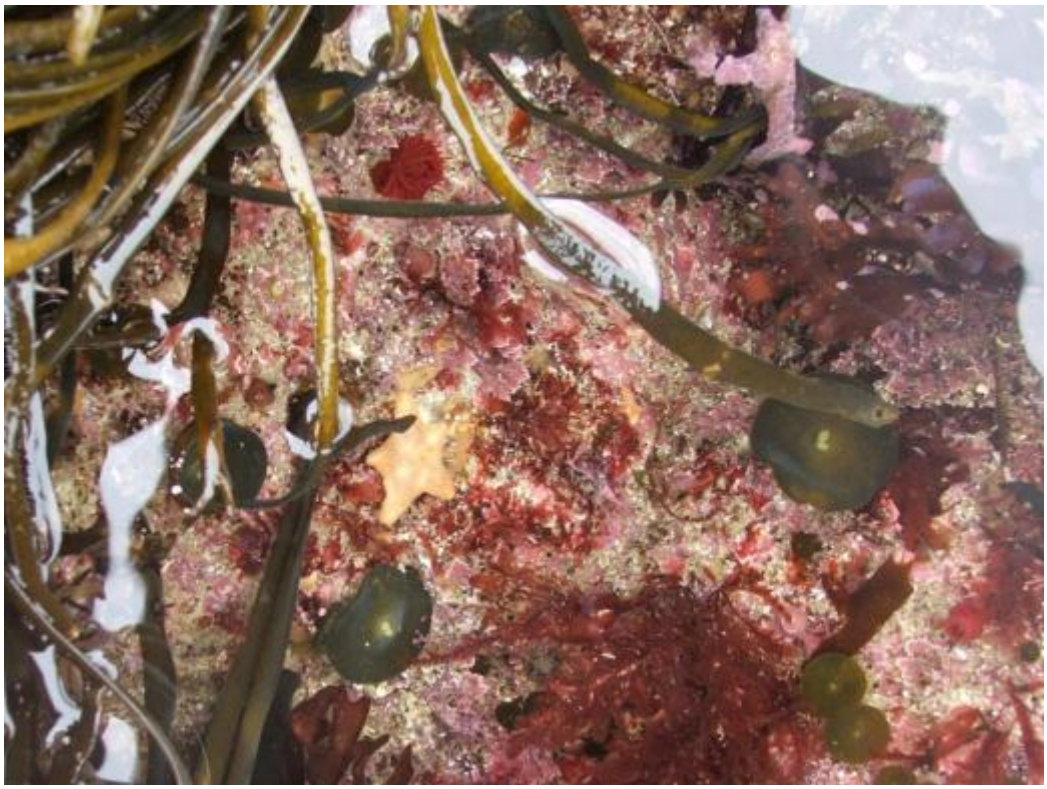

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Plate 5 Intertidal under-boulder communites – calcareous red algae, beadlet anemone, discs of Himanthalia elongata and the red algae Mastocarpus stellatus

© Natural England

Plate 6 Intertidal under-boulder communites – calcareous red algae, discs of *Himanthalia elongata* and red algae *Mastocarpus stellatus* with jewel anemones *Corynactis viridis* in a crevice

Gugh

Dropnose Porth (OS grid ref. SV 98242 08280)

3.18 This moderately exposed, east facing embayment situated on Gugh's east coast forms part of an AONB, and SAC.

3.19 Large boulders are the predominant geological feature on this gently sloping shore; with a high percentage of very large and small boulders, and an underlying coarse sediment of sand, cobbles, pebbles and gravel making up the rest of the substrata in sequentially smaller percentages. Lichens were present on large boulders at the base of the rammed earth cliff in the supralittoral zone.

Plate 7 Lichens on large boulders (left)

Plate 8 Abundant *Fucus* in the mid shore (right)

3.20 The mid shore was dominated by a superabundant *Fucus vesiculosus* which led to a band of superabundant *Fucus serratus* with frequent *Mastocarpus stellatus* and *Cladophora rupestris.* Spirorbids, pink encrusting coralline algae, beadlet anemones *Actinia equina,* and flat top shells *Gibbula umbilicalis* were also frequent on the mid shore.

3.21 The under-boulder zone on the lower shore was dominated by superabundant *Himanthalia elongata* with abundant *Bifurcaria bifurcata* on sediment covered boulders. *Chondrus crispus* and pink encrusting coralline algae were found to be frequent in the understory with diverse faunal communities including frequent indeterminate porifera crusts, abundant daisy anemones *Cereus pedunculatus,* frequent snakelocks anemone *Anemonia viridis,* and occasional squat lobsters *Galathea squamifera,* broad-clawed porcelain crabs *Pisidia longicornis* and flat top shells *G. umbilicalis*.

3.22 The presence and relative abundance of blue rayed limpets, *Patella pellucida* and snakelocks anemones *Anemonia viridis* was consistent with the 2010 ShoreSearch survey where a small number of *Patella pellucida* and numerous *Anemonia viridis* were recorded on the lower shore (Oliver, 2010).

St Mary's

Toll's Island, north side (OS grid ref. SV 92974 12042)

3.23 Toll's Island's north shore is situated just off St Mary's east coast and is situated within an AONB and SAC.

3.24 This north facing, gently sloping, sheltered rocky shore has a mixed substrata of boulders on pebbles and sand.

3.25 Distinct lichen and *Pelvetia canaliculata* zones were present in the littoral fringe; whilst the upper eulittoral was dominated by *Ascophyllum nodosum* leading to a *Fucus serratus* zone in the mid eulittoral.

3.26 In the under-boulder zone on the lower shore abundant *Himanthalia elongata* was mixed with numerous other brown algae including *Leathesia marina* and *Sargassum muticum* which were recorded as common, with frequent *Laminaria digitata* and *Bifurcaria bifurcata*. Spirobids and *Mesophyllum lichenoides* were commonly found in the understory with frequent indeterminate corallinaceae and numerous frequently occurring foliose reds, including *Chondrus crispus*, *Mastocarpus stellatus, Gymnogongrus crenulatus* and *Polyides rotundus.*

3.27 Numerous anemones and encrusting sponges were present among the intertidal under-boulder faunal assemblages. The red speckled anemone *Anthopleura ballii* was recorded as common with frequent *Aulactinia verrucosa* and occasional *Anemonia viridis. Ophlitaspongia papilla, Halichondria panicea* and indeterminate porifera crusts were common among the sponges with frequent *Dysidea fragilis*; and frequent branching bryozoans *Scrupocellaria sp.* were found with occasional *Turbicellepora magnicostata* and indeterminate bryozoa crusts. Although recorded as rare at this site, the scarlet and gold star coral *Balanophyllia (Balanophyllia) regia* and the Devonshire cup coral *Caryophyllia smithii* are noteworthy as the former is nationally scarce whilst the latter is listed in the Convention on International Trade in Endangered Species of wild fauna and flora (CITES). These species of coral were also recorded as being present in small numbers during the 2009 Isles of Scilly Marine Biodiversity Project (IoSMBP, 2009).

Plate 9 The nationally scarce *Balanophyllia (Balanophyllia) regia*

Toll's Island, south side (OS grid ref. SV 93067 11884)

3.28 The south shore on Toll's Island is situated within an AONB, SAC and within the Peninnis to Dry Ledge site of the MCZ.

3.29 This south facing, gently sloping moderately exposed rocky shore has a stable mixed substrata of boulders, cobbles and pebbles.

3.30 An underdeveloped lichen zone of occasional *Lichina pygmaea* was present in the upper littoral fringe with abundant *Chthamalus montagui*; commonly occurring *Patella vulgata* and frequent *Phorcus lineatus* and *Melarhaphe neritoides*.

3.31 The mid eulittoral zone was dominated by superabundant *Fucus serratus* and abundant *Fucus vesiculosus* with commonly present *Spirorbis spirorbis;* frequent *Patella vulgata*, and occasional top shells *Gibbula cineraria* and *Gibbula umbilicalis* with flat periwinkles *Littorina obtusata/fabalis*.

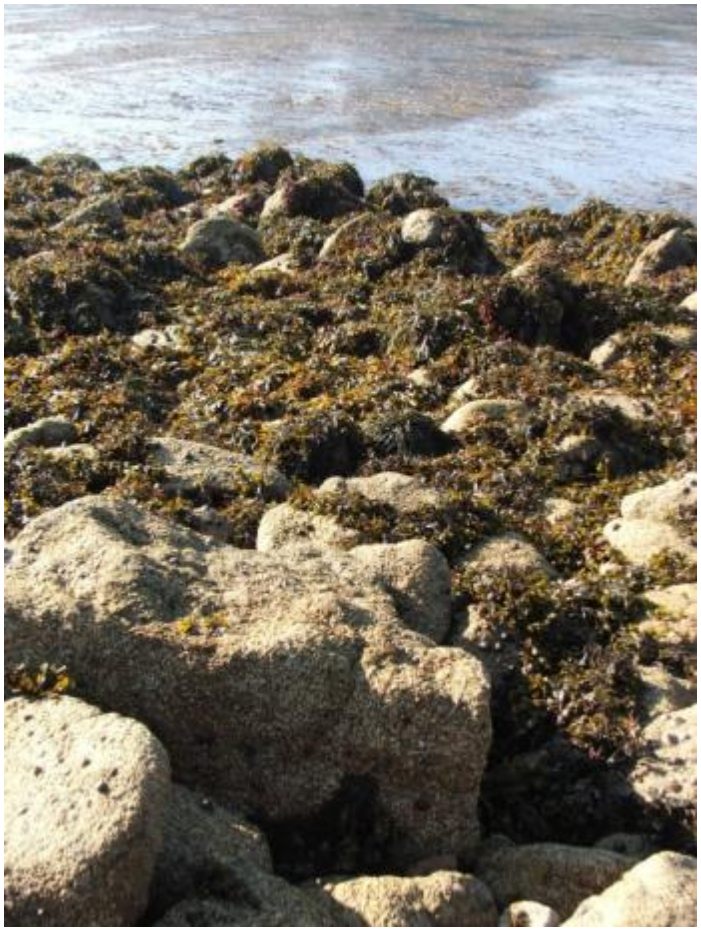

Plate 10 Mid eulittoral zone – Rock with *Fucus sp.* and topshells

3.32 Superabundant *Himanthalia elongata* dominated the under-boulder zone on the lower shore with frequent red algae in the understory, including *Chondracanthus acicularis*, *Chondrus cripsus and Mastocarpus stellatus. Spirorbis (Spirorbis) tridentatus* and pink encrusting coralline algae were found to be common beneath the canopy of *H. elongata* with occasional *Mesophyllum lichenoides* and indeterminate porifera crusts. The ascidian *Aplidium pallidum*, sea snails *Rissoa parva*, long and broad-clawed porcelain crabs *Pisidia longicornis* and *Porcellana platycheles* were all recorded as frequent with occasional grey top shells *G. cineraria*.

3.33 Although *Asterina phylactica* was only recorded as rare at this site, this cushion star is still noteworthy as it is a nationally scarce species.

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Plate 11 Intertidal under-boulder communites – *H. elongata* & abundant varieties of red algae

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Plate 12 Lower shore with abundant *H. elongata* and *Laminaria digitata*

Pelistry Bay (OS grid ref. SV 92922 11825)

3.34 Pelistry Bay lies just south of Toll's Island on St Mary's east coast, and forms part of the AONB and SAC as well as lying within the Peninnis to Dry Ledge site of the MCZ.

3.35 The substratum on this moderately exposed, east facing embayment is comprised of small and large boulders, with a small percentage of very large boulders that occur at the top of the shore, and an underlying coarse sediment of cobbles, pebbles and sand.

3.36 *Fucus vesiculosus* and *Patella vulgata* were common in the lower littoral fringe with frequent *Phorcus lineatus* and occasional spirorbids. The upper eulittoral zone was dominated by superabundant *Ascophyllum nodosum* upon which the epiphytic siphon weed *Vertebrata lanosa* was occasionally present. Frequent spirorbids and *P. vulgata* were also present in the upper eulittoral zone. Superabundant *Fucus serratus* peppered with abundant spirorbids dominated the mid shore; flat top shells *Gibbula umbilicalis* were found to be common on rock in the understory with frequent *P. vulgata*, pink encrusting coralline algae and foliose red algae *Chondrus crispus, Mastocarpus stellatus* and *Osmundea pinnatifida.*

3.37 The under-boulder zone on the lower shore was dominated by superabundant *Himanthalia elongata* with a diverse array of red, green and brown algae, including commonly present *Bifurcaria bifurcata* with frequent *Saccharina latissima*. The foliose red algae *C. crispus* and *M. stellatus* were common in the understory with frequent *Polyides rotundus* and pink encrusting coralline algae and occasional *Ceramium sp.* Among the faunal assemblages the snail *Rissoa parva* was common with frequent spirorbids and a variety of anemones including occasional *Anemonia viridis.*

Plate 13 Abundant *Himanthalia elongata* in the lower shore

3.38 In 2009 surveyors on the Isles of Scilly Marine Biodiversity Project recorded the non-native species *Sargassum muticum* and *Asparagopsis armata* as 'noticeable' and *H. elongata* as 'common on the boulders of the lower shore'. No invasive non-native species of algae were recorded during the course of the 2011 Natural England survey; however it is possible that these species were obscured by the increased cover of *H. elongata.* The daisy anemone *Cereus pedunculatus* was also recorded as present in 2009 but was not found at this site during the Natural England survey (IoSMBP, 2009).

Old Town Bay, east side (OS grid ref. SV 91387 10093)

3.39 Old Town Bay is situated on St Mary's south coast and forms part of an AONB, SAC and the Peninnis to Dry Ledge site of the MCZ.

3.40 The west facing, rocky shore of this small relatively sheltered embayment is primarily composed of large and small boulders with a small percentage of very large boulders and an underlying coarse sediment of cobbles, pebbles and sand.

3.41 The upper littoral fringe was dominated by occasional lichens; with the shrubby sea ivory *Ramalina siliquosa* and black tar lichen *Verrucaria maura* leading in to a band of occasional yellow lichens *Caloplaca marina.*

3.42 In the upper and mid eulittoral zone *Patella vulgata* and *Phorcus lineatus* are commonly present with occasional *Chthamalus montagui*. On the lower shore flat periwinkles *Littorina obtusata/fabalis* were common among abundant *Fucus serratus;* beneath which pink encrusting corallines were common with frequent *Patella vulgata* and *Gibbula umbilicalis*, and occasional *Phorcus lineatus.*

3.43 The under-boulder zone on the lower shore was dominated by a mosaic of red and fucoid brown algae which was largely composed of abundant *Himanthalia elongata,* commonly present *Saccharina latissima* and *Chondracanthus acicularis,* and occasional *Sargassum muticum.* Frequent foliose reds including *Chondrus crispus, Mastocarpus stellatus and Osmundea pinnatifida* were present amongst the fucoid browns; with occasional *Ulva lactuca* localised around a fresh water run-off. Numerous anemones including frequent *Aulactina verrucosa* and pink encrusting coralline algae were present in the understory with occasional indeterminate porifera and bryozoa crusts. The orange peel bryozoan *Turbicellepora magnicostata* was also present at this site but was found to occur only rarely. Within the UK this species is only known to occur on the Isles of Scilly.

Plate 14 Boulders in the midshore at Old Town Bay east side

3.45 During the Isles of Scilly Marine Biodiversity Project, undertaken by the Isles of Scilly Wildlife Trust in 2009, ShoreSearch recorded the stalked jellyfish *Lucernariopsis campanulata* as common at this site; however Natural England's 2011 survey found it to occur only rarely. Natural England surveyors also recorded the St John's jellyfish *Lucernariopsis cruxmelitensis,* which was not recorded by ShoreSearch in 2009 (IoSMBP, 2009). Although both species of jellyfish were only recorded as rare, their presence is still noteworthy as they are both UK BAP[7] species and Species of Conservation Importance for the selection of MCZ areas.

3.46 ShoreSearch also recorded the invasive non-native harpoon weed *Asparagopsis armata* as noticeable at this site (IoSMBP, 2009); but none was found during the course of Natural England's surveys of Old Town Bay. A further variation between the two surveys was the abundance recorded for *Fucus vesiculosus,* where in 2009 ShoreSearch recorded it as dominant on the mid shore, in 2011 Natural England recorded *F. vesiculosus* with *F. spiralis* as rare in the upper and mid eulittoral shore; with *Fucus serratus* as abundant in the lower shore zone.

Old Town Bay, west side (OS grid ref. SV 91271 09995)

3.47 Old Town Bay is situated on St Mary's south coast and forms part of an AONB, SAC and the Peninnis to Dry Ledge site of the MCZ.

3.48 In the areas surveyed, it was observed that the West side shore had a greater component of sand along the littoral fringe and fewer boulders on the lower shore than the East side of the bay (westerly facing).

3.49 In the upper littoral fringe a compressed band of lichens led in to a band of *Pelvetia canaliculata* followed by *Fucus spiralis.*

3.50 In the upper eulittoral zone the blow lug *Arenicola marina* was present within the patches of muddy sand inside the band of sand that led in to a band of *Fucus serratus* and *Ascophyllum nodosum*. In the mid eulittoral zone boulders were covered by dense mosaic of *F. serratus*, *Fucus vesiculosus* and *A. nodosum.*

3.51 Himanthalia elongata, F. serratus and the foliose red Lomentaria articulata were common in the under-boulder zone on the lower shore with occasional F. vesiculosus, Bifurcaria bifurcata, Leathesia marina (formerly L. difformis), Chondracanthus acicularis, Polyides rotundus, Heterosiphonia plumosa, Osmundea pinnatifida, Vertebrata lanosa and Ulva lactuca. Pink encrusting coralline algae were common on rock with occasional Audouinella sp. and Hildenbrandia rubra. The boulders in the lower eulittoral zone also supported diverse faunal communities which include frequent starfish Luida ciliaris and encrusting bryozoans with occasional Actinia equina, Anemonia viridis, Chthamalus stellatus, Rissoa parva and *Porcellana platycheles*.

3.52 Although recorded as rare at this survey site, the St John's jellyfish *Lucernariopsis cruxmelitensis* is still noteworthy as this is a UK BAP species and MCZ Species Of Conservation Importance.

[7] In 2012 the UK BAP lists were superceded by the UK Post-2010 Biodiversity Framework but the term 'BAP' species is still used to refer to such species (JNCC and DEFRA, 2012).

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Plate 15 *Himanthalia elongata, F. serratus* and the foliose red *Lomentaria articulate* with occasional *Ulva lactuca* in the lower shore

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Plate 16 Mixed red seaweeds and green *Ulva sp*. with encrusting red algae and spirorbid worms

Porth Loo (OS grid ref. SV 90826 11463)

3.53 Porth Loo, situated on the west side of St Mary's is situated within an AONB and SAC.

3.54 The low-relief bedrock and boulder shore of this sheltered west facing embayment has a mixed substrata of boulders on pebbles and sand.

3.55 The shore is backed by a rammed earth cliff with boulders and an under developed lichen zone at its base. The band of sand in the littoral fringe led in to bedrock with a broad barnacle and limpet zone before graduating in to *Fucus spiralis* and shallow rockpools in the upper eulittoral zone. In the mid shore narrow bands of *Fucus vesiculosus* and *Fucus serratus* led in to *Himanthalia elongata*.

3.56 The under-boulder zone on the lower shore was dominated by superabundant *Himanthalia elongata* and commonly present *Bifurcaria bifucata*. Pink encrusting coralline algae including *Mesophyllum lichenoides* were common in the understory with red algae including, *Audouinella sp. Chondrus crispus* and *Gymnogongrus crenulatus.* The invasive non-native harpoon weed *Asparagopsis armata* was also present here and was described as frequent. The lower eulittoral zone also supported diverse faunal communities which included abundant indeterminate porifera crusts; commonly present spirorbids and blow lugs *Arenicola marina;* with frequent beadlet anemones *Actinia equina,* grey top shells *Gibbula cineraria,* cushion stars *Asterina gibbosa,* brittlestars *Ophiothrix fragilis* and shannys *Lipophrys pholis. T*he squat lobster *Galathea squamifera* and the crabs *Porcellana platycheles*, *Xantho pilipes and Pagurus sp.* were also frequently present among the intertidal under-boulder communities with occasional *Xantho hydrophilus.* The orange peel bryozoan *Turbicellepora magnicostata* was also present at this site but was found to occur only rarely. Although only a single *Asterina phylactica* was recorded at this site, this cushion star is still noteworthy due to its nationally scarce status.

3.57 The sea squirt *Corella eumyota* was also recorded in the under-boulder zone at this site, and although only one was recorded it is still worth noting as it is an invasive non-native species. *C. eumyota* was also found in the neighbouring St Mary's harbour during the course of the Isles of Scilly Marine Biodiversity Project undertaken by the Isles of Scilly Wildlife Trust (Gall, 2011).

3.58 During the Isles of Scilly Marine Biodiversity Project, undertaken by the Isles of Scilly Wildlife Trust in 2009, ShoreSearch recorded the broad clawed porcelain crab *Porcellana platycheles* and the star ascidian *Botryllus schlosseri* as common at this site (IoSMBP, 2009); in contrast these species were recorded as frequent and rare respectively during the 2011 Natural England survey.

3.59 It is not possible to make any additional appropriate comparisons between the results of the 2009 survey and those of Natural England as the Isles of Scilly Marine Biodiversity Project survey report made no further references to the intertidal under-boulder zone in Porth Loo.

Tresco

Appletree Point (OS grid ref. SV 88851 14182)

3.60 Appletree point is situated within the tidal straight on Tresco's west coast and forms part of the AONB, and SAC. Its sheltered west facing, bedrock and boulder shore has an underlying course sediment of cobbles, pebbles and sand at the lower shore.

3.61 The surveyors recorded good fucoid zonation, with narrow bands of *Pelvetia canaliculata, Fucus spiralis* and *Ascophyllum nodosum*, and an extensive *Fucus serratus* boulder field leading to a *Himanthalia elongata* zone on rich diverse boulders on sand.

3.62 A narrow band of the black tar lichen *Verrucaria maura* was abundant in the upper littoral fringe where *P. canaliculata* was found to occur commonly with occasional *Chthamalus montagui, Phorcus lineatus* and *Littorina saxatilis.* In the lower littoral fringe abundant *F. spiralis* and commonly present *L. saxatilis* were recorded with occasional *C. Montagui* and *P. lineatus.*

3.63 Superabundant *Ascophyllum nodosum* dominated the upper eulittoral zone with frequent beadlet anemones *Actinia equina* and occasional gastropods, including *Gibbula umbilicalis, Littorina saxatilis* and *Patella vulgata*.

3.64 An extensive canopy of superabundant *F. serratus* dominated the mid shore, beneath which *Hildenbrandia rubra* and pink encrusting algae were abundant with frequent *Rissoa parva* and occasional *Aulactinia verrucosa, P. vulgata, G. umbilicalis, Littorina obtusata/fabalis*, *Carcinus maenas, Porcellana platycheles,* spirorbids and amphipods. The orange peel bryozoan *Turbicellepora magnicostata* was also present at this site but was found to occur only rarely.

Plate 17 *Ascophyllum nodosum* dominant with some *Fucus spiralis*

3.65 A mosaic of red, brown and green algae were present in the under-boulder zone on the lower shore where abundant *H. elongata* was prevalent. *Bifurcaria bifurcata* and *Ulva sp.* occurred commonly with occasional *Sargassum muticum.* The foliose red algae *Mastocarpus stellatus* and *Osmundea osmunda* were common in the understory, with frequent pink encrusting corallines and occasional *H. rubra*. The boulder habitat in this zone supported diverse faunal assemblages which included the snakelocks anemone *Anemonia viridis,* which was found to be common with

occasional gem anemones *Aulactinia verrucosa,* ascidians *Aplidium pallidum,* indeterminate crisiidae and broad-clawed porcelain crab *P. platycheles.*

3.66 During their survey ShoreSearch recorded the long clawed porcelain crab *Pisidia longicomis* at this site (Oliver, 2010); however this species was not recorded by Natural England in 2011. As the relative abundance of *Pisidia longicomis* was not provided in the ShoreSearch report, and no other species in the under-boulder zone were referred to, it is not possible to make a significant comparison between this survey and the one conducted by Natural England in 2011.

Plumb Island (OS grid ref. SV 88632 14875)

3.67 Plumb Island is situated within the tidal straight on Tresco's west coast and forms part of the AONB, and SAC.

3.68 This very sheltered boulder shore with an underlying coarse sediment of cobbles, pebbles and sand and has a dense fucoid cover.

3.69 There were clear bands of *Ramalina siliquosa* and *Verrucaria maura* lichens in the supralittoral zone which led in to *Pelvetia canaliculata* with some *Fucus vesiculosus* at the littoral fringe.

3.70 Superabundant *Ascophyllum nodosum* dominated the mid shore with *Fucus serratus*, pink encrusting coralline algae, spirorbid polychaetes, *Patella vulgata, Lacuna vincta, Littorina obtusata/fabalis* and amphipods all being recorded as common in this zone. The epiphytic siphon weed *Vertebrata lanosa* and *Spirorbis spirorbis* were frequently present with occasional *Actinia equina, Dendrodoa grossularia, Porcellana platycheles, Gibbula umbilicalis and Phorcus lineatus.*

3.71 The under-boulder zone on the lower shore was dominated by superabundant *F. serratus* covered in abundant *Spirorbis spirorbis.* Pink encrusting coralline algae were frequently present in the understory with occasional encrusting red alga *Hildenbrandia rubra* and occasional *Pelvetia canaliculata,* indeterminate ectocarpaceae (simple brown algae), *Chondrus crispus,* and *Audouinella sp.* The broad-clawed porcelain crab *P. platycheles* and common shore crab *Carcinus maenas* were common among the intertidal under-boulder faunal communities, with frequent baked bean ascidians *D. grossularia;* occasional porifera crusts and occasional gastropods, *P. vulgata, G. umbillicalis* and *L. vincta.*

3.72 During the Isles of Scilly Marine Biodiversity Project, undertaken by the Isles of Scilly Wildlife Trust in 2009, ShoreSearch recorded *Ascophyllum nodosum* and *Fucus serratus* as dominant on the rocky area that sloped down towards the sandy channel (IoSMBP, 2009); these results were in keeping with those found during Natural England's survey in 2011. However it is not possible to make any further significant or appropriate comparisons between the results of the 2009 survey and the one conducted by Natural England in 2011 as the intertidal under-boulder zone in Plumb Island was not specifically referred to in the Isles of Scilly Marine Biodiversity Project survey results.

St Martin's

English Island Point (OS grid ref. SV 93770 15222)

3.73 English Island Point is located on the south side of St Martin's and forms part of an AONB, SAC and the Higher Town site of the MCZ.

3.74 The upper reaches of this sheltered south facing bedrock and boulder shore only had a small percentage of boulders, but this increased in the mid eulittoral zone where boulders cover up to 60% of the surface.

3.75 The littoral fringe was very impoverished and characterised by occasional *Fucus spiralis, Pelvetia canaliculata* and *Ulva sp.*

3.76 The upper eulittoral zone was dominated by a dense cover of superabundant knotted wrack *Ascophyllum nodosum,* upon which *Littorina obtusata/fabalis* and the epiphytic siphon weed *Vertebrata lanosa* were frequently present. Pink and red encrusting algae were occasionally present on rock in the understory with *Chthamalus montagui, Patella vulgata, Phorcus lineatus* and *Gibbula umbilicalis*.

3.77 A superabundant *Fucus serratus* zone on the mid shore led in to a raised band of superabundant *C. montagui* with commonly occurring *Fucus vesiculosus* and *P. vulgata,* and frequent *Ulva* sp. This band filtered back in to another band of superabundant *F. serratus* on bedrock with commonly occurring pink encrusting algae and frequent foliose reds, *Mastocarpus stellatus* and *Lomentaria articulata.* The hydroid *Dynamena pumila* and the common limpet *P. vulgata* were also frequently present within this band.

Plate 18 Superabundant *Fucus serratus* zone on the mid shore

3.78 The under-boulder zone on the lower shore supports a broad mix of red, brown and green algae amongst the superabundant *Himanthalia elongata*. *M. stellatus* was common in the understory with frequent *Audouinella sp.*, frequent *Chondrus crispus* and occasional *Osmundea pinnatifida.* The intertidal under-boulder communities within this zone had diverse faunal assemblages that included *Anemonia viridis, Aplidium pallidum* (notable on foliose reds)*, Rissoa parva, Crisia sp.* and *Turbicellepora magnicostata* all of which were recorded as occasionally present.

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Plate 19 Lower shore with abundant *Himanthalia elongata* and *Fucus sp.* moving up the shore

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Plate 20 Close up of *Himanthalia elongate*

3.79 The 2010 ShoreSearch Survey Report listed *Botryllus scholsseri*, *Tricolia pullus*, *Nassarius reticulata, Littorina obtusata* and *Aplysiidae sp*. as present on the lower shore (Oliver, 2010). However, as the relative abundance of these species was not provided in the ShoreSearch report it is not possible to make a significant comparison between this survey and the one conducted by Natural England in 2011. However, it is worth noting that of the animal species listed as being present on the lower shore by ShoreSearch in 2010 only the pheasant shell *T. pullus* and the flat periwinkle *L. obtusata/fabalis* were recorded during Natural England's 2011 survey, and then in very low number.

3.80 During monitoring undertaken for the JNCC in 1984 (Hiscock, 1985) and Porcupine Marine Natural History Society in 2010 (Hiscock, 2011) a number of faunal species were recorded that were not seen during the 2011 Natural England survey and vice versa. The disparity between species recorded in 1984, 2010 and 2011 is outlined in the table below.

Table 2 Comparison of faunal species abundance recorded in 1984, 2010 and 2011

Species	Hiscock, 1984 abundance	2010 Porcupine MNHS Survey	Natural England abundance
Spirorbids	Abundant	Frequent	Rare
Gibbula cineraria	Common/Abundant	Occasional	Rare
Galathea squamifera	Common	Occasional	not recorded
Asterina gibbosa	Frequent	not recorded	not recorded
Diplosoma listerianum	Frequent	not recorded	not recorded
Didemnidae unidentified	Frequent	Occasional	not recorded
Necora puber	Frequent	Occasional	not recorded
Marthasterias glacialis	Frequent	Occasional	not recorded
Myxilla sp.	Frequent	Rare	not recorded
Pisidia longicornis	Frequent	Rare	not recorded
Botryllus schlosseri	Occasional	Occasional	not recorded
Ophiothrix fragilis	Occasional	Rare	Rare
Ophlitaspongia papilla	Frequent	not recorded	Rare
Porifera	Occasional	Rare	Rare
Hymeniacidon perleve	Rare (n=1)	not recorded	Rare
Spirobranchus triqueter	Occasional	Rare	Rare
Anemonia viridis	not recorded	Abundant	Occasional
Aplidium pallidum	not recorded	Rare	Occasional
Rissoa parva	not recorded	*Rissoa sp*. Rare	Occasional
Crisia sp.	not recorded	not recorded	Occasional
Turbicellepora magnicostata	Present on each of the surveyed boulders	Occasional	Occasional

3.81 Data from the 2010 study by the Porcupine Marine Natural History Society are based on an estimated average, since abundance records were given for each boulder surveyed, not the site overall. All surveys used the SACFOR scale and took place in Spetember in each year.

3.82 Some species do appear to show a decline, for example, spirorbids, *G. cineraria*, *A. gibbosa*, *M. glacialis*, and the crustaceans *N. puber* & *P. longicornis*, and *G. squamifera*. There may have been variations in the tidal cycle and survey effort - for example, with eight people surveying with PMNHS in 2010 (Hiscock, 2011) and two surveyors in 2011. THE PMNHS study also focussed on animal species rather than general biology, which may have skewed the recording of species.

3.83 These differences are likely due to variations in survey effort and natural change, and more detailed long-term monitoring of this site would be needed to draw firm conclusions about long term change.

St Lawrence’s Bay (OS grid ref. SV 92480 15649)

3.84 St Lawrence’s Bay is sheltered by St Martin's Flats and forms part of the AONB, SAC and St Martin's Sedimentary Shore Site of Special Scientific Interest (SSSI).

3.85 This south-west facing cobble shore has a mixed substratum of boulders, cobbles, pebbles and sand. The dune backed shore graduates from fine to coarse sand with occasional boulders, leading in to cobbles and occasional boulders on course sand in the mid and lower shore, before returning to sand and the associated sediment communities in the lower eulittoral zone.

Plate 21 Coarse sand with occasional boulders dominated by *F. serratus* with frequent *F. Vesiculosus*

3.86 The mid eulittoral zone was dominated by superabundant *Fucus vesiculosus and* abundant *Fucus serratus* with frequent spirorbids and commonly present *Ascophyllum nodosum.* Common limpets *Patella vulgata*, broad-clawed porcelain crabs *Porcellana platycheles* and common shore crabs *Carcinus maenas* were all recorded as frequent in the understory, with occasional *Actinia equina, Chthamalus montagui, Littorina obtusata/fabalis, Phorcus lineatus, Gibbula umbillicalis,* and indeterminate bryozoa crusts.

3.87 The under-boulder zone on the lower shore was dominated by superabundant *F. serratus* with frequent *F. vesiculosus,* upon which the associated *L. obtusata/fabalis* and tube worm *Spirorbis spirorbis* were recorded as being occasionally present. Pink encrusting coralline algae were common in the understory with diverse faunal assemblages that included frequent *P. vulgata* and occasional *G. umbilicalis* and *C. maenas.* The orange peel bryozoan *Turbicellepora magnicostata* was also present at this site but was found to occur only rarely, as was the cushion star *Asterina phylactica*, which is also noteworthy as it is a nationally scarce species.

Plate 22 Lower shore with boulders and *F. serratus* with frequent *F. vesiculosus*

3.88 The site recorders also noted a lot of “dead bivalve shells” on the lower shore.

3.89 The intertidal under-boulder zone at this site has not been studied before and as such this survey provides a baseline for future monitoring. However ShoreSearch did survey the nearby Jack’s ledge in 2009, during the Isles of Scilly Marine Biodiversity Project survey.

4 Conclusion

4.1 The 2011 monitoring showed the shores to be in favourable condition where baseline data was available. For those sites with no baseline data the surveys established a baseline and methodology for future monitoring.

4.2 Positive aspects of the 2011 survey are that on St Marys island at Old Town Bay (East) and Pelistry Bay, the 2010 Shoresearch survey found evidence of invasive non-native species including *Sargassum muticum*, and *Asparagopsis armata*, which were not found in the 2011 Natural England survey. This shows that the invasive species have not increased in abundance or proliferated.

4.3 Within Porth Loo on St. Mary's the invasive sea squirt *Corella eumyota* was recorded once, and could be a species to monitor in the future to record any increase in distribution.

4.4 On Tresco, the well-known invasive algae *Sargassum muticum* was recorded as 'occasional' at Appletree Point which is another consideration for future monitoring. However Appletree Point showed the continued presence of *Turbicellepora magnicostata*, at an 'occasional' level which has only been recorded in the UK at the Isles of Scilly (Hughes, 2002 & (NBN [Seasearch], 2012-2013[8]).

4.5 Other positive signs of healthy biodiversity include the presence of stalked Jellyfish (BAP species) including *L. campanulata* and *L cruxmelitensis* at Old Town Bay East side and *L. cruxmelitensis* at Old Town Bay West side on St Mary's. The presence of the scarlet and gold star coral *Balanophyllia (Balanophyllia) regia* and the Devonshire cup coral *Caryophyllia smithii* (a BAP/CITES species) at Dropnose Porth, Gugh are also signs that the sites contiunue to support species that are scarce and of notable conservation importance.

4.6 At St Lawrence's Bay on St. Martins, the nationally scarce starfish *Asterina phylactica* was also recorded.

4.7 Some animal species previously recorded in 2010 in the Shoresearch survey were found in lower abundance or were not found in 2011. This included the following sites: English Island Point; Plumb Island; and Periglis, Burnt Island. In particular, fewer crabs (*P. platycheles*), fish (*L. lepadogaster*), brittlestars and sponges were found. At English Island Point, when compared to a survey in 1984, a total of 15 species appear to be no longer present or to show reduced abundance. However, this could be due to a variation in weather / tidal pattern or a difference in survey effort or method and it is not possible to draw conclusions about whether the species are now permanently absent from the sites. This is an area to consider for future surveying which could focus on confirming records of animal species present and in particular rare and / or BAP species.

4.8 Repeated monitoring occurs on a six year cycle, with the next intertidal survey due in 2017. Additional surveys may be carried out prior to this by volunteers or Wildlife Trusts, and in particular this could provide additional records for BAP / CITES species or invasive non-native species to identify new sightings or changes in distribution. Such data would not replace regulatory monitoring but can be useful to inform future surveyors of interim changes.

4.9 This survey provided updated monitoring assessment of the under-boulder communities, which are a biotope within the SAC 'Reef' feature, and are now a designated feature of some of the

[8] **http://jncc.defra.gov.uk/pdf/UKBAP_BAPHabitats-20-IntertidalUboulderComms.pdf**
https://data.nbn.org.uk/Taxa/NBNSYS0000188574 NBN Gateway survey data updated 2013

Isles of Scilly MCZ sites. This provides a baseline for future monitoring of the habitat and provided a strong evidence base for the designation of the feature.

4.10 Overall, the Isles of Scilly intertidal sites show a diverse range of intertidal algal and animal species, and few sightings of invasive species, which demonstrates the sites continue to be in favourable condition, supporting numerous species of national and international conservation interest.

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Appendix 1 Species recorded in intertidal under-boulder zone the Convention of Biological Diversity

St Agnes

Periglis, Burnt Island

Sponge:
Ophlitaspongia papilla
Porifera (crusts) unidentified

Anemones:
Actinia equina
Actinia fragacea
Aiptasia mutabilis
Anemonia viridis
Aulactinia verrucosa
Cereus pedunculatus

Annelids:
Alentia gelatinosa
Harmothoe sp.
Spirorbis sp.

Polychaete unidentified

Crustaceans:
Cancer pagurus
Carcinus maenas
Galathea squamifera
Porcellana platycheles
Sphaeroma sp.
Xantho hydrophilus

Amphipoda unidentified
Isopoda unidentified

Arthropods:
Pycnogonid unidentified

Molluscs:
Calliostoma zizyphinum
Gibbula cineraria

Gibbula umbillicalis
Patella pellucida
Phorcus lineatus
Rissoa parva

Bryozoa:
Alcyonidium gelatinosum
Membranipora membranacea

Echinoderms:
Asterina gibbosa
Ophiothrix fragilis
Ophiuroidea unidentified

Ascidians:
Aplidium sp.
Botryllus schlosseri

Fish:
None recorded

Corrallines:
Corallina officianalis
Mesophyllum lichenoides
pink encrusting coralline

Red algae:
Audouinella sp.
Ceramium sp.
Chondrus crispus
Chondracanthus acicularis
Gastroclonium ovatum
Gelidium sp.
Heterosiphonia plumosa
Hildenbrandia rubra
Mastocarpus stellatus
Osmundea osmunda
Palmaria palmata
Polyides rotundus

Brown algae:
Bifurcaria bifurcata
Dictyosiphon foeniculaceus
Himanthalia elongata
Leathesia sp.

Saccharina latissima
Saccorhiza polyschides

Green algae:
Cladophora pellucida
Cladophora sp.
Ulva sp.

Wingletang Bay

Sponge:
Grantia compressa
Halichondria panicea
Hymeniacidon perlevis
Ophlitaspongia papilla
Porifera (crusts) *unidentified*

Hydriods:
Obelia geniculata
Obelia sp.

Anemones:
Actinia equina
Anemonia viridis
Aulactinia verrucosa
Cereus pedunculatus
Corynactis viridis
Urticina felina

Annelids:
Spirorbis sp.

Polychaete unidentified

Crustaceans:
Idotea granulose
Pisidia longicornis
Porcellana platycheles

Amphipoda unidentified
Caprellidae unidentified

Coleoptera:
Aepus sp.

Molluscs:
Calliostoma zizyphinum
Gibbula umbillicalis
Patella pellucida
Hiatella arctica
Nucella lapillus
Patella vulgata
Rissoa parva
Tectura virginea

Bryozoa:
Crisia sp.
Electra pilosa
Membranipora membranacea
Oshurkovia littoralis

Bryozoa (crusts) unidentified

Echinoderms:
Amphipholis squamata

Ascidians:
Aplidium pallidum
Aplidium proliferum
Botryllus schlosseri
Aplidium elegans

Fish:
None recorded

Corrallines:
Corallina officianalis
Mesophyllum lichenoides
pink encrusting coralline

Red algae:
Audouinella sp.
Calliblepharis jubata
Chondrus crispus
Gastroclonium ovatum
Gigartina sp.
Lomentaria articulata
Halurus equisetifolius
Heterosiphonia plumosa
Hildenbrandia rubra

Mastocarpus stellatus
Osmundea osmunda
Osmundea pinnatifida
Phycodrys rubens
Plumaria plumose
Vertebrata lanosa
Pterothamnian plumula

Brown algae:
Ectocarpus sp.
Fucus serratus
Himanthalia elongata
Laminaria digitata
Saccorhiza polyschides

Green algae:
Cladophora pellucida
Cladophora rupestris
Codium sp.
Ulva sp.

Gugh

Dropnose Porth

Sponge:
Terpios fugax

Porifera (crusts) unidentified

Anemones:
Actinia equina
Anemonia viridis
Aulactinia verrucosa
Cereus pedunculatus

Anemone unidentified

Annelids:
Arenicola marina
Harmothoe sp.
Spirorbis sp.

Polychaete unidentified

Crustaceans:
Cancer pagurus
Carcinus maenas
Galathea squamifera
Palaemon serratus
Porcellana platycheles
Xantho hydrophilus

Amphipoda unidentified

Molluscs:
Calliostoma zizyphinum
Gibbula cineraria
Gibbula umbillicalis
Patella pellucida
Rissoa parva

Bryozoa:
Alcyonidium gelatinosum
Bryozoa (crusts) *unidentified*

Echinoderms:
Asterina gibbosa
Ophiothrix fragilis

Ascidians:
Aplidium pallidum
Aplidium proliferum
Botryllus schlosseri
Morchellium argus

Fish:
Lepadogaster lepadogaster
Lipophrys pholis
Nerophis lumbriciformis

Corrallines:
Corallina officianalis
Mesophyllum lichenoides
pink encrusting coralline

Red algae:
Audouniella sp.
Ceramium sp.
Chondrus crispus

Gelidium spinosum
Heterosiphonia plumosa
Hildenbrandia rubra
Lomentaria articulata
Mastocarpus stellatus
Osmundea osmunda
Osmundea pinnatifida
Vertebrata lanosa
Rhodophyta unidentified

Brown algae:
Bifurcaria bifurcata
Ectocarpus sp.
Fucus serratus
Himanthalia elongata
Laminaria digitata
Laminaria hyperborea
Leathesia marina

Green algae:
Cladophora rupestris
Cladophora sp.
Ulva sp.

St Mary's

Toll's Island, north

Sponge:
Halichondria panacea
Ophlitaspongia papilla
Sycon ciliatum
Terpios fugax

Porifera (crusts) *unidentified*

Anemones:
Anemonia viridis
Anthopleura ballii
Aulactinia verrucosa
Cereus pedunculatus
Urticina felina

Annelids:
Harmothoe sp.
Nereis sp.

Spirorbis sp.

Crustaceans:
Galathea squamifera
Necora puber
Pisidia longicornis
Porcellana platycheles
Xantho pilipes

Paguridae unidentified

Arthropods:
Pycnogonid unidentified

Molluscs:
Berthellina citrina
Calliostoma zizyphinum
Gibbula cineraria
Patella pellucida
Patella vulgata
Rissoa parva
Tricolia pullus

Polyplacophora unidentified
unidentified white lamellibranch

Bryozoa:
Dysidea fragilis
Scrupocellaria sp.
Turbicellepora magnicostata

Echinoderms:
Asterina gibbosa
Echinus esculentus
Luidia ciliaris
Marthasterias glacialis
Ophiothrix fragilis

Ascidians:
Aplidium pallidum
Aplidium proliferum
Botryllus schlosseri
Didemnum sp.

colonial ascidian *unidentified*

Coral:
Balanophyllia (Balanophyllia) regia
Caryophyllia smithii

Fish:
Lepadogaster lepadogaster

Corrallines:
Corallina sp.
Mesophyllum lichenoides
pink encrusting coralline

Red algae:
Asparagopsis armata
Rhodothamniella floridula
Chondrus crispus
Chylocladia verticillata
Cryptoplerua ramosa
Cystoclonium sp
Furcellaria lumbricalis
Gastroclonium ovatum
Gymnogongrus crenulatus
Heterosiphonia plumosa
Hildenbrandia rubra
Lomentaria articulata
Osmundea pinnatifida
Polyides rotundus
Rhodophyta unidentified

Brown algae:
Bifurcaria bifurcata
Ectocarpus sp.
Fucus serratus
Himanthalia elongata
Laminaria digitata
Leathesia marina
Saccharina latissima
Saccorhiza polyschides
Sargassum muticum

Green algae:
Cladophora rupestris
Ulva lactuca

Toll's Island, south

Sponge:
Grantia compressa
Halichondria panicea
Hymeniacidon perlevis
Ophlitaspongia papilla
Porifera (crusts) *unidentified*

Anemones:
Actinia equine
Anemonia viridis
Anthopleura ballii
Aulactinia verrucosa
Cereus pedunculatus

Annelids:
Harmothoe sp.
Spirorbis sp.
Spirorbis (Spirorbis) tridentatus

Crustaceans:
Galathea squamifera
Hippolyte varians
Pinnotheres pisum
Pisidia longicornis
Porcellana platycheles
Xantho hydrophilus

Amphipoda unidentified

Arthropods:
Pycnogonid unidentified

Molluscs:
Gibbula cineraria
Rissoa parva

Bryozoa: none recorded

Echinoderms:
Asterina phylactica
Luidia ciliaris
Marthasterias glacialis

Ascidians:
Aplidium pallidum
Aplidium proliferum

Coral:
Ballanophyllia regia

Fish:
None recorded

Corrallines:
Corallina officianalis
Mesophyllum lichenoides
pink encrusting coralline

Red algae:
Chondracanthus acicularis
Chondrus crispus
Gastroclonium ovatum
Halurus equisetifolius
Heterosiphonia plumosa
Hildenbrandia rubra
Lomentaria articulata
Mastocarpus stellatus
Osmundea pinnatifida
Vertebrata lanosa

Brown algae:
Laminaria digitata
Laminaria hyperborea
Himanthalia elongata
Sacchoriza polyschoides

Ectocarpaceae unidentified brown algae family

Green algae:
Cladophora rupestris
Ulva sp.

Old Town, east

Sponge:
Sycon ciliatum
Terpios fugax

Hydriods:
Dynamena pumila

Anemones:
Actinia equina
Actinia fragacea
Anemonia viridis
Anthopleura ballii
Aulactinia verrucosa
Urticina felina

Jellyfish:
Lucernariopsis campanulata
Lucernariopsis cruxmelitensis

Annelids:
Arenicola marina
Nereis sp.
Spirorbis sp.

Crustaceans:
Carcinus maenas
Crangon crangon
Galathea squamifera
Idotea baltica
Necora puber
Pagurus sp.
Porcellana platycheles
Xantho hydrophilus

Molluscs:
Calliostoma zizyphinum
Gibbula cineraria
Gibbula umbillicalis
Patella pellucida
Littorina obtusata/fabalis
Rissoa parva
Rissoa sp.

Bryozoa:
Turbicellepora magnicostata

Bryozoa (crusts) *unidentified*

Echinoderms:
Asterina gibbosa
Echinus esculentus
Luidia ciliaris
brittlestar unidentified

Ascidians:
Aplidium pallidum
Aplidium proliferum
Botryllus schlosseri
Morchellium argus

colonial ascidian unidentified

Fish:
Lipophrys pholis

Corrallines:
Corallina officianalis
pink encrusting coralline

Red algae:
Audouinella sp.
Chondracanthus acicularis
Chondrus crispus
Gelidium spinosum
Gigartina pistillata
Heterosiphonia plumosa
Hildenbrandia rubra
Osmundea pinnatifida
Polyides rotundus
Vertebrata lanosa

Brown algae:
Ascophyllum nodosum
Himanthalia elongata
Leathesia marina
Saccharina latissima
Sargassum muticum

Green algae:
Cladophora rupestris
Codium sp.
Ulva sp.

Old Town, west

Sponge:
Halichondria panacea
Hymeniacidon perleve
Terpios fugax

Anemones:
Actinia equine
Anemonia viridis
Aulactinia verrucosa

Jellyfish:
Lucernariopsis cruxmelitensis

Annelids:
Harmothoe sp.
Spirorbis

Crustaceans:
Chthamalus stellatus
Galathea squamifera
Porcellana platycheles
Xantho hydrophilus

Arthropods:
Pycnogonid unidentified

Molluscs:
Callochiton septemvalvis
Gibbula cineraria
Gibbula umbillicalis
Patella vulgata
Rissoa parva
Rissoidea unidentified

Bryozoa:
Bryozoa (crusts) *unidentified*

Echinoderms:
Luidia ciliaris
Ophiothrix fragilis

Ascidians:
Aplidium pallidum

Aplidium proliferum
Morchellium argus

colonial ascidian *unidentified*

Fish:
None recorded

Corrallines:
Lithophyllum incrustans

Red algae:
Audouinella sp.
Chondracanthus acicularis
Gracilaria gracilis
Heterosiphonia plumosa
Hildenbrandia rubra
Lomentaria articulata
Mastocarpus stellatus
Osmundea pinnatifida
Polyides rotundus
Vertebrata lanosa

Brown algae:
Bifurcaria bifurcata
Fucus serratus
Fucus vesiculosus
Himanthaliaelongata
Leathesia marina
Saccharina latissima

Phaeophyta (crusts) unidentfied

Green algae:
Ulva lactuca

Pelistry Bay

Sponge:
Grantia compressa
Porifera (crusts) unidentified

Anemones:
Actinia fragacea
Anemonia viridis
Anthopleura ballii

Aulactinia verrucosa

Annelids:
Alentia gelatinosa
Nereis sp.
Polynoidae sp.
Spirorbis sp.

Crustaceans:
Cancer pagurus
Carcinus maenas
Galathea squamifera
Paguridae unidentified

Molluscs:
Gibbula cineraria
Gibbula umbillicalis
Patella pellucida
Nassarius pygmaeus
Littorina obtusata/fabalis
Nucella lapillus
Rissoa parva

Bryozoa:
Membranipora membranacea

Bryozoa (crusts) *unidentified*

Echinoderms:
Luidia ciliaris
Ophiothrix fragilis

Ophiurida brittlestar unidentified

Ascidians:
Aplidium pallidum
Botryllus schlosseri
colonial ascidian *unidentified*

Fish:
None recorded

Corrallines:
Corallina officianalis
Mesophyllum lichenoides

pink encrusting coralline

Red algae:
Audouinella sp.
Ceramium sp.
Chondracanthus acicularis
Chondrus crispus
Furcellaria sp.
Gelidium sp.
Gracilaria gracilis
Hildenbrandia rubra
Mastocarpus stellatus
Polyides rotundus

Brown algae:
Bifurcaria bifurcata
Ectocarpus sp.
Fucus serratus
Himanthalia elongata
Leathesia marina
Saccharina latissima
Saccorhiza polyschides

Green algae:
Cladophora rupestris
Ulva lactuca

Porth Loo

Sponge:
Ophlitaspongia papilla
Caprellidae unidentified
Porifera (crusts) unidentified

Anemones:
Actinia equina
Anemonia viridis
Aulactinia verrucosa

Annelids:
Arenicola marina
Corella eumyota
Harmothoe sp.
Spirorbis sp.
Polychaete unidentified.

Crustaceans:
Cancer pagurus
Galathea squamifera
Necora puber
Palaemon serratus
Porcellana platycheles
Xantho hydrophilus
Xantho pilipes
Amphipod unidentified
Isopod unidentified.
Paguridae unidentified

Arthropods:
Pycnogonid unidentified.

Molluscs:
Calliostoma zizyphinum
Gibbula cineraria
Mytilus sp.
Tricolia pullus
Polyplacophora unidentified

Bryozoa:
Turbicellepora magnicostata

Echinoderms:
Asterina gibbosa
Asterina phylactica
Luidia ciliaris
Ophiothrix fragilis

Ascidians:
Aplidium pallidum
Aplidium proliferum
Botryllus schlosseri
Corella sp.
Morchellium argus
Polyclinum aurantium
colonial ascidian unidentified

Fish:
Lepadogaster lepadogaster
Lipophrys pholis
Nerophis lumbriciformis

Corrallines:
Corallina sp.
Mesophyllum lichenoides
pink encrusting algae

Red algae:
Asparagopsis armata
Audouinella sp.
Ceramium sp.
Chondracanthus acicularis
Chondrus crispus
Cladostephus spongiosus
Gastroclonium ovatum
Gymnogongrus crenulatus
Heterosiphonia plumosa
Hildenbrandia rubra
Mastocarpus stellatus
Osmundea osmunda
Polysiphonia sp.

Brown algae:
Bifurcaria bifurcata
Halopteris filicina
Himanthalia elongata
Laminaria digitata
Sacchoriza polyschides

Green algae:
Bryopsis plumosa
Cladophora sp
Codium sp.
Cystoseira tamariscifolia
Ulva lactuca

Tresco

Appletree Point

Sponge:
Ophlitaspongia papilla
Hymeniacidon perlevis
Terpios fugax
Porifera (crusts) unidentified

Anemones:
Anemonia viridis

Anthopleura ballii
Aulactinia verrucosa
Cereus pedunculatus
Sagartia elegans
Urticina felina

Annelids:
Harmothoe sp.
Spirorbis sp.

Crustaceans:
Cancer pagurus
Galathea squamifera
Necora puber
Porcellana platycheles
Paguridae unidentified

Molluscs:
Calliostoma zizyphinum
Cerastoderma edule
Gibbula umbillicalis
Nassarius pygmaeus
Patella vulgata
Tectura virginea

Bryozoa:
Alcyonidium gelatinosum
Alcyonidium hirsutum
Crisia sp.
Electra pilosa
Turbicellepora magnicostata
Oshurkovia littoralis
Bryozoa (crusts) unidentified

Echinoderms:
Asterina gibbosa
Luidia ciliaris
Ophiothrix fragilis

Ascidians:
Alcyonidium sp.
Aplidium pallidum
Aplidium proliferum
Botrylloides leachii
Aplidium elegans

colonial ascidian unidentified

Fish:
None recorded

Corrallines:
Corallina officinalis
Mesophyllum lichenoides
pink encrusting coralline

Red algae:
Asparagopsis armata
Ceramium sp.
Chondracanthus acicularis
Chondrus crispus
Gelidium spinosum
Gelidium pusillum
Gigartina sp.
Hildenbrandia rubra
Lomentaria articulata
Mastocarpus stellatus
Osmundea osmunda
Vertebrata lanosa

Brown algae:
Bifurcaria bifurcata
Ectocarpus sp.
Himanthalia elongata
Leathesia marina
Sargassum muticum
foliose brown unidentified algae

Green algae:
Cladophora rupestris
Cladophora sp.
Ulva intestinalis
Ulva sp.

Plumb Island

Sponge:
Porifera (crusts) unidentified

Anemones:
Actinia equina
Aulactinia verrucosa

Annelids:
Spirorbis spirorbis
Spirorbis sp.
Pomatoceros unidentified
Polychaete unidentified

Crustaceans:
Cancer pagurus
Carcinus maenas
Porcellana platycheles
Xantho hydrophilus
Amphipoda unidentified

Molluscs:
Calliostoma zizyphinum
Gibbula cineraria
Gibbula umbillicalis
Nassarius sp.
Lacuna vincta
Littorina saxitilis
Littorina obtusata/fabalis
Nucella lapillus
Ocinebrina aciculata
Patella vulgata
Polyplacophora sp.
Turritellidae unidentified

Bryozoa:
Alcyonidium gelatinosum
Electra pilosa
Bryozoa (crusts) unidentified

Echinoderms:
Asterina gibbosa
Ophiuroidea unidentified

Ascidians:
Aplidium proliferum
Botryllus schlosseri
Dendrodoa grossularia

Fish:
Nerophis lumbriciformis

Corrallines:
pink encrusting coralline

Red algae:
Audouinella sp.
Chondracanthus acicularis
Chondrus crispus
Hildenbrandia sp.
Lomentaria articulata
Rhodophyceae unidentified

Brown algae:
Ascophyllum nodosum
Fucus serratus
Pelvetia canaliculata
Ectocarpaceae unidentified

Green algae:
Ulva sp.

St Martin's

English Island Point

Sponge:
Hymeniacidon perleve
Ophiltaspongia sp.
Porifera (crusts) unidentified

Hydriods:
Dynamena pumila

Anemones:
Actinia fragacea
Anemonia viridis
Anthopleura ballii
Aulactinia verrucosa
Cereus pedunculatus
Corynactis viridis
Sagartia elegans
Sagartiogeton sp.
Urticina felina

Jellyfish:
Lucernariopsis campanulata

Annelids:
Spirobranchus triqueter
Spirorbis sp.

Crustaceans:
Carcinus maenas
Chthamalus montagui

Amphipoda unidentified
Isopod unidentified
Paguridae unidentified
Spider crab unidentified

Arthropods:
Pycnogonid unidentified

Molluscs:
Calliostoma zizyphinum
Nassarius pygmaeus
Gibbula cineraria
Gibbula umbillicalis
Littorina obtusata/fabalis
Patella vulgata
Rissoa parva
Tricolia pullus
Opisthobranchia unidentified

Bryozoa:
Crisia sp.
Electra pilosa
Membranipora membranacea
Turbicellepora magnicostata
Oshurkovia littoralis
Bryozoa (crusts) unidentified

Echinoderms:
None recorded

Ascidians:
Aplidium pallidum
Aplidium proliferum

Fish:
Lepadogaster lepadogaster

Corrallines:
Corallina officianalis
Mesophyllum lichenoides
pink encrusting coralline

Red algae:
Asparagopsis armata
Audouniella sp.
Chondracanthus acicularis
Chondrus crispus
Gigartina pistillata
Hildenbrandia rubra
Jania rubens
Mastocarpus stellatus
Osmundea osmunda
Osmundea pinnatifida
Polyides rotundus
Vertebrata lanosa
Rhodymenia pseudopalmata

Brown algae:
Himanthalia elongata
Saccharina latissima
Saccharina polyschides
Sargassum muticum
Ectocarpaceae unidentified

Green algae:
Cladophora rupestris
Cladophora sp.
Codium sp.
Ulva sp.

St Lawrence's Bay

Sponge:
Porifera (crusts) unidentified

Anemones:
Actinia equina
Actinia fragacea
Aulactinia verrucosa
Cereus pedunculatus

Annelids:
Alentia gelatinosa
Nemertea sp.
Nereis sp.
Spirorbis spirorbis
Spirorbis sp.

Crustaceans:
Carcinus maenas
Chthamalus montagui
Galathea squamifera
Pisidia longicornis
Porcellana platycheles
Xantho hydrophilus
Xantho pilipes
Amphipoda unidentified
Paguridae unidentified

Coleoptera:
Aepus robinii

Molluscs:
Calliostoma zizyphinum
Gibbula umbillicalis
Nassarius reticulata
Nassarius incrassatus
Littorina obtusata/fabalis
Nucella lapillus
Phorcus lineatus
Patella vulgata

Bryozoa:
Turbicellepora magnicostata
Bryozoa (crusts) unidentified

Echinoderms:
Asterina gibbosa
Asterina phylactica
Ophiothrix fragilis
Ophiuroidea unidentified

Ascidians:
Aplidium pallidum
Aplidium proliferum
Botrylloides leachii
Botryllus schlosseri
Aplidium elegans
Ampharatidae unidentified
colonial ascidian unidentified
Didemnid unidentified

Fish:
Lepadogaster lepadogaster
Lipophrys pholis
Pholis gunnellus

Corrallines:
pink encrusting coralline

Red algae:
Audouinella sp.
Chondrus crispus
Hildenbrandia rubra
Hildenbrandia sp.
Lomentaria articulata
Mastocarpus stellatus
Odonthalia dentata

Brown algae:
Ascophyllum nodosum
Ectocarpus sp.
Fucus serratus
Fucus vesiculosus

Green algae:
Cladophora rupestris
Ulva sp.

Appendix 2 Index to common names, groups, recent synonyms & designations

Sponge:
Halichondria panacea - breadcrumb sponge
Sycon ciliatum (recent synonyms Scypha cilliata)
Grantia compressa recent synomym *Scypha compressa*
Hymeniacidon perlevis recent synonym *Hymeniacidon perleve*

Anemones:
Actinia equina - beadlet anemone
Actinia fragacea - strawberry anemone
Aiptasia mutabilis - trumpet anemone
Anemonia viridis - snakelocks anemone
Anthopleura ballii - red speckled pimplet anemone
Aulactinia verrucosa - gem anemone (recent synonym *Bunodactis verrucosa*)
Cereus pedunculatus - daisy anemone
Corynactis viridis - jewel anemone
Urticina felina - dahlia anemone

Jellyfish:
Lucernariopsis campanulata - a stalked jellyfish (UK BAP species)
Lucernariopsis cruxmelitensis - St John's jellyfish (UK BAP species)

Annelids:
Alentia gelatinosa - a bristle worm
Arenicola marina - blow lug
Harmothoe sp. - a scale worm
Nemertea sp - a ribbon worm
Polynoidae sp. - a scale worm
Spirobranchus triqueter - a tube (recent synonym *Pomatoceros triqueter)*
Spirorbis spirorbis - a tube worm
Spirorbis (Spirorbis) tridentatus - a tube worm

Crustaceans:
Austrominius modestus – a barnacle species formerly known as *Elminius modestus*
Cancer pagurus - edible crab
Caprellidae unidentified - a skeleton shrimp
Carcinus maenas - common shore crab
Chthamalus montagui - Montagu's stellate barnacle
Chthamalus stellatus - Poli's stellate barnacle
Crangon crangon - brown shrimp
Galathea squamifera - squat lobster

Hippolyte varians - chameleon prawn
Idotea baltica - an isopod
Idotea granulose - an isopod
Necora puber - velvet swimming crab
Paguridae unidentified - hermit crab
Palaemon serratus - common prawn
Pinnotheres pisum - pea crab
Pisidia longicornis - long-clawed porcelain crab
Porcellana platycheles - broad-clawed porcelain crab
Sphaeroma sp.- a sea slater
Xantho hydrophilus - Montagu's crab (recent synonym *Xantho incisus*)
Xantho pilipes - Risso's crab

Arthropods:
Pycnogonid - a sea spider

Coleoptera:
Aepus robinii - a marine beetle

Molluscs:
Berthellina citrina - a sea slug
Calliostoma zizyphinum - painted top snail
Callochiton septemvalvis - a chiton
Cerastoderma edule - common cockle
Gibbula cineraria - grey topshell
Gibbula umbillicalis - flat top shell
Hiatella arctica - wrinkled rock borer
Nassarius pygmaeus- small dog whelk (recent synonym *Hinia pygmaea*)
Nassarius reticulate (recent synonym *Hinia reticulate*)
Nassarius incrassata (recent synonym *Hinia incrassatus*)
Nassarius sp.(recent synonym *Hinia sp.*)
Lacuna vincta - banded chink shell
Littorina obtusata - common flat periwinkle
Littorina fabalis – flat periwinkle (recent synonym *Littorina fabalis* = *Littorina mariae*)
Littorina saxatilis – recent synonym *Littorina neglecta*
Nucella lapillus - dog whelk
Phorcus lineatus- thick top shell (recent synonyms *Osilinus / Monodonta lineatus*)
Patella vulgata - common limpet
Patella pellucida - blue rayed limpet (recent synonym *Helcion pellucidum*)
Polyplacophora unidentified - chiton
Rissoa parva - a snail
Tectura virginea - white tortoiseshell limpet
Tricolia pullus - pheasant shell
Turritellidae unidentified - tower shells

Bryozoa:
Alcyonidium gelatinosum - jelly bryozoan
Electra pilosa - a sea mat
Membranipora membranacea - sea mat
Turbicellepora magnicostata - orange peel bryozoans (Nationally Rare)
Oshurkovia littoralis (recent synonym *Umbonula littoralis*)

Echinoderms:
Amphipholis squamata - small brittlestar
Asterina gibbosa – a cushion star
Asterina phylactica – a cushion star (Nationally Scarce)
Echinus esculentus - edible sea urchin
Luidia ciliaris - seven armed starfish
Marthasterias glacialis - spiny starfish
Ophiothrix fragilis - common brittlestar
Ophiuroidea unidentified - a brittlestar

Ascidians:
Botrylloides leachii - a colonial sea squirt
Botryllus schlosseri - star ascidian
Corella eumyota - a solitary sea squirt (Invasive Non-Native Species)
Dendrodoa grossularia - baked bean ascidian
Morchellium argus - a sea squirt
Aplidian elegans (recent synonym *Sydnium elegans*)

Fish:
Lepadogaster lepadogaster - Cornish sucker/cling fish
Lipophrys pholis - shanny
Nerophis lumbriciformis - worm pipe fish
Pholis gunnellus - butterfish

Coral:
Balanophyllia (Balanophyllia) regia - scarlet and gold star coral (Nationally Scarce)
Caryophyllia smithii - Devonshire cup coral (CITES species)

Red algae:
Asparagopsis armata - harpoon weed (Invasive Non-Native Species)
Chondrus crispus - carrageen
Mastocarpus stellatus - false Irish moss
Vertebrata lanosa (recent synonym *Polysiphonia lanosa*)
Gelidium spinosum (recent synonym *Gelidium latifolium*)
Rhodothamniella floridula (recent synonym *Audouinella floridula*)
Rhodophyta unidentified - non-calcareous crusts

Brown algae:
Ascophyllum nodosum - knotted wrack
Fucus serratus - toothed wrack
Fucus spiralis - spiral wrack
Fucus vesiculosus - bladder wrack
Himanthalia elongata - thongweed
Laminaria digitata - oarweed
Leathesia marina - sea potato or sea cauliflower
Pelvetia canaliculata - channelled wrack
Saccharina latissima - sugar kelp (recent synonym *Laminaria saccharina*)
Saccorhiza polyschides - furbelows (recent synonym *Saccorhiza bulbosa*, *Laminaria polyschides*)
Sargassum muticum - wireweed (Invasive Non-Native Species)

Green algae:
Ulva intestinalis - gut weed (recent synonym *Enteromorpha intestinalis*
Ulva sp. (recent synonym *Enteromorpha* sp.)
Ulva lactuca - sea lettuce

Appendix 3 Detailed quadrat survey results for under-boulder zone

Site: Periglis, Burnt Island, St Agnes
Surveyors: J. Bussell & R.Pipkin

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Animal species					
Anemones:					
Actinia equina	2	2	n1		
Anemonia viridis	n1	n1		n15	
Aulactinia verrucosa	n8	n4		n1	
Cereus pedunculatus		n1			
Annelids:					
Alentia gelatinosa	n1				
Harmothoe sp.	n1		n1		n2
Spirorbis sp.	20%	20%	10%	10%	10%
Acidians:					
Aplidium sp.			5%		
Botryllus schlosseri				1%	
Bryozoa:					
Alcyonidium gelatinosum	1%	3%			
Crustaceans:					
Cancer pagurus				n1	
Carcinus maenas				n1	
Galathea squamifera	n4			n1	
Porcellana platycheles	n1				
Xantho hydrophilus					n1
Amphipoda unidentified				n10	
Isopoda unidentified	n1				
Polychaeta unidentified	n10			n1	
Echinoderms:					
Asterina gibbosa	n3	n1			n2
Ophiothrix fragilis	n1				
Ophiuroidea unidentified	n2				
Molluscs:					
Calliostoma zizyphinum	n1				
Dictyosiphon foeniculaceus		2%			
Gibbula cineraria	n3	n10			
Gibbula umbillicalis	n7	n1			n6
Rissoa parva	n100	n50			
Sea spider:					
Pycnogonid				n1	

Table continued…

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Sponges:					
Ophlitaspongia papilla			<1%		1%
Porifera crusts unidentified		1%	10%		10%
Algae /plants / lichens					
Brown algae:					
Bifurcaria bifurcata				5%	
Himanthalia elongata	30%	30%	10%	40%	70%
Palmara palmata	20%		5%		
Saccharina latissima	10%	20%			
Coralline algae:					
Corallina officianalis	<1%		5%		1%
Lithothamnion sp.	80%	50%	50%	5%	25%
Mesophyllum lichenoides	1%	2%	3%		
Green algae:					
Cladophora pellucida	1%				1%
Cladophora sp.			1%	5%	
Ulva sp.	2%	<1%	5%	5%	10%
Red algae:					
Audouniella sp.		3%	10%	30%	5%
Ceramium sp.	5%	20%	2%	5%	10%
Chondracanthus acicularis	2%	2%	1%	30%	10%
Chondrus crispus		4%	2%	5%	10%
Gastroclonium ovatum		2%			
Gelidium sp.			0.5%		1%
Heterosiphonia plumosa		1%			
Hildenbrandia rubra	1%	5%		2%	
Mastocarpus stellatus				5%	
Osmundea osmunda	1%	5%	3%	5%	3%

Site: Wingletang, St Agnes
Surveyors: I. Reach & W. Smyth

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Animal species					
Anemones:					
Anemonia viridis	n1				
Aulactinia verrucosa	n2		n1		
Cereus pedunculatus			n5		
Corynactis viridis			n25		
Urticina felina		n1			
Annelids:					
Spirorbis sp.		2%	1%	10%	2%
Polychaete unidentified					n2
Ascidians:					
Aplidium proliferum		2%			
Botryllus schlosseri				1%	
Bryozoa:					
Crisia sp		5%			
Electra pilosa		n1%			1%
Membranipora membranacea			n2%		
Oshurkovia littoralis					1%
other encrusting bryozoans		5%			
Crustaceans:					
Idotea granulosa					n1
Pisidia longicornis					n2
Porcellana platycheles				n2	n3
Amphipoda unidentified				n1	n1
Echinoderms:					
Amphipholis squamata				n1	
Hydriods:					
Obelia sp		<1%			
Insecta:					
Aeopopis sp		n1			
Molluscs:					
Gibbula umbillicalis					n2
Patella pellucida	n12	n5	n11		
Hiatella arctica					n3
Rissoa parva		n50		n50	
Tectura Virginea			n3		
Sponges:					
Caprellidae unidentified	n1				
Grantia compressa		n50		n1	n50
Ophlitaspongia papilla		5%	3%		
orange encrusting sponge				1%	
other encrusting sponges			2%		

Table continued…

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Algae /plants / lichens					
Brown algae:					
Himanthalia elongata	100%	40%	70%	25%	60%
Laminaria digitata			30%	5%	30%
Coralline algae:					
Corallina officianalis	10%	10%	20%	2%	10%
Lithothamnion sp		20%	80%	50%	50%
Mesophyllum lichenoides	80%	30%	5%	5%	
Green algae:					
Cladophora rupestris				3%	
Red algae:					
Chondrus crispus	1%	5%	2%	30%	20%
Gastroclonium ovatum				10%	
Gigartina sp.				1%	
Heterosiphonia plumosa				10%	20%
Hildenbrandia rubra				5%	10%
Mastocarpus stellatus		30%	5%		
Osmundea osmunda			1%		
Osmundea pinnatifida				2%	
Vertebrata lanosa			2%		
Pterothamnian plumula					1%

Site: Dropnose Porth, Gugh
Surveyors: S. McNair & R. Williams

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Animal species					
Anemones:					
Actinia equina	n1		n1	n3	
Anemonia viridis			n1		n1
Aulactinia verrucosa		n5			
Cereus pedunculatus	n50	n1	n50		n1
Anemone unidentified			n1		
Annelids:					
Arenicola marina	n1				n1
Harmothoe sp					n1
Polychaete unidentified				n1	
Spirorbis sp.		1%	1%		
Ascidians:					
Aplidium pallidum		1%	1%		
Botryllus scholosseri			<1%		
Morchellium argus		<1%			
Bryozoa:					
Alcyonidium gelatinosum				1%	<1%
other encrusting bryozoans		<1%			
Crustaceans:					
Cancer pagurus	n1				
Carcinus maenas				n1	n1
Galathea squamifera	n3		n1		n3
Palaemon serratus					n1
Porcellana platycheles	n1		n3	n10	n8
Xantho hydrophilus	n1				n1
Amphipoda unidentified				n1	
Echinoderms:					
Asterina gibbosa			n1		n1
Ophiothrix fragilis				n3	
Fish:					
Lepadogaster lepadogaster			n1		
Lipophrys pholis					n1
Nerophis lumbriciformis					n1
Molluscs:					
Gibbula umbillicalis	n16	n2	n5	n40	n4
Patella pellucida		n3			
Sponges:					
Terpios fugax		<1%			
other encrusting sponges		5%	10%		10%

Table continued…

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Algae /plants / lichens					
Brown algae:					
Bifurcaria bifurcata	30%	20%		30%	25%
Ectocarpus sp			1%		
Fucus serratus				1%	
Himanthalia elongata	50%	25%	25%	15%	15%
Laminaria hyperborea		10%			
Leathesia marina	1%		1%	<1%	1%
Coralline algae:					
Corallina officianalis	1%				2%
Lithothamnion sp.	25%	20%	30%	50%	30%
Mesophyllum lichenoides	10%	20%	2%	1%	5%
Green algae:					
Cladophora rupestris		5%			1%
Ulva sp.	5%			15%	
Red algae:					
Audouniella sp.				1%	
Ceramium sp.	1%	15%			
Chondrus crispus	10%		5%	10%	5%
Gelidium spinosum	1%				
Hildenbrandia rubra	1%			1%	<1%
Mastocarpus stellatus		15%			5%
Osmundea osmunda		5%		2%	5%
Vertebrata lanosa	1%			5%	5%

Site: Toll's Island, north
Surveyors: A. Gall, R. Pipkin

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Animal species					
Anemones:					
Anthopleura ballii	n2	n4	n4	n3	n1
Aulactinia verrucosa	n3	n1	n7	n10	n3
Urticina felina	n1	n3			n1
Annelids:					
Spirorbis sp.	<1%	30%			10%
Ascidians:					
Aplidium pallidum	1%			<1%	2%
Aplidium proliferum			n1		
Botryllus scholosseri		1%			
Didemnum sp.	5%		20%	1%	
encrusting seasquirts	10%	10%	1%		1%
Bryozoa:					
Dysidea fragilis		10%			
Scrupocellaria sp.	20%		10%	5%	
Turbicellepora magnicostata	<1%		5%		
Crustaceans:					
Galathea squamifera	n2		n1		
Necora puber	n1				
Paguridae				n1	
Pisidia longicornis		n1			
Xantho pillipedes		n1	n2		
Echinoderms:					
Luidia ciliaris				n2	
Ophiothrix fragilis		n1			
Fish:					
Lepadogaster lepadogaster					n1
Molluscs:					
Calliostoma zizyphinum	n1				
Gibbula cineraria	n1	n1		n9	
Patella pellucida	n1				
Patella vulgata	n2				
Rissoa parva				n>100	n>100
Sea spider:					
Pycnogonid		n1	n1		
Sponges:					
Scypha cilliata			n1		
Halichondria panicea		10%			
orange encrusting sponge	2%				
other encrusting sponges		20%			10%

Table continued…

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Algae /plants / lichens					
Brown algae:					
Bifurcaria bifurcata	<1%		30%	15%	
Ectocarpus sp.				10%	20%
Himanthalia elongata	100%	100%	80%	90%	100%
Leathesia marina				<1%	
Saccharina latissima					10%
Sacchoriza polyschoides	10%	20%			
Sargassum muticum			25%	25%	
Coralline algae:					
Corallina sp.	20%	30%	15%		
Lithothamnion sp.		20%			30%
Mesophyllum lichenoides	60%	60%	30%	15%	40%
Green algae:					
Cladophora rupestris	<1%		<1%		
Ulva lactuca			1%	2%	
Red algae:					
Audouinella floridula			20%		2%
Chondrus crispus	30%		10%		20%
Chylocladia verticillata			1%		
Cryptoplerua ramosa		1%			
Cystoclonium sp.	<1%				
Furcellaria lumbricalis			1%	2%	
Gymnogongrus crenulatus				20%	
Heterosiphonia plumosa					2%
Hildenbrandia rubra					2%
Osmundea pinnatifida		10%			<1%
Polyides rotundus	10%				<1%
red algal turf unidentified	10%	10%			

Site: Toll's Island, south
Surveyors: I. Reach, W. Smyth

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4
Animal species				
Anemones:				
Anemonia viridis	n1			
Anthopleura ballii	n7			
Aulactinia verrucosa	n2			
Cereus pedunculatus		n2		
Annelids:				
Harmothoe sp.	n1			
Spirorbis sp.	20%		5%	
Spirorbis (Spirorbis) tridentatus			n5	n3
Ascidians:				
Aplidium pallidum		<1%		
Coral:				
Ballanophyllia regia	n3			
Crustaceans:				
Galathea squamifera	n4			n1
Pinnotheres pisum	n1			
Pisidia longicornis			n1	
Porcellana platycheles	n3		n1	n1
Xantho hydrophilus	n1			
Amphipoda unidentified			n1	
Echinoderms:				
Luidia ciliaris		n1		
Marthasterias glacialis	n2		n1	
Molluscs:				
Gibbula cineraria	n1	n2	n2	n8
Rissoa parva		<100		
Sponges:				
Halichondria panicea		1%		
Hymeniacidon perleve	5%	2%		
Ophlitaspongia papilla	<1%			
orange encrusting sponge		5%		
other encrusting sponges	2%			20%
Algae /plants / lichens				
Brown algae:				
Himanthalia elongata	30%	80%	80%	80%
Laminaria hyperborea		15%		
Sacchoriza polyschoides			25%	5%
Coralline algae:				
Corallina officianalis			2%	
Lithothamnion sp.	95%	20%	80%	40%
Mesophyllum lichenoides	10%	80%	25%	60%

Table continued…

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4
Green algae:				
Ulva sp			<1%	
Red algae:				
Chondracanthus acicularis		2%	2%	
Chondrus crispus	5%	5%	10%	20%
Gastroclonium ovatum				1%
Halurus equisetifolius	5%	5%		5%
Heterosiphonia plumosa	2%			
Hildenbrandia rubra			5%	
Lomentaria articulata				1%
Mastocarpus stellatus	5%		5%	10%
Osmundea pinnatifida	2%	2%	2%	5%
Vertebrata lanosa	5%			

Site: Pelistry
Surveyors: J. Bussell, S. McNair

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Animal species					
Anemones:					
Aulactinia verrucosa			n1		n1
Anthopleura ballii	n2	n3	n2	n1	n2
Anemonia viridis	n3	n5	n3	n2	n1
Actinia fragacea			n1		
Annelids:					
Alentia gelatinosa			n1		
Nereis sp.				n2	
Polynoidae sp.					n1
Spirorbis sp.	*1%*	*1%*	*1%*	*1%*	*1%*
Ascidians:					
Aplidium pallidum	1%		1%		1%
encrusting seasquirts	1%	1%	1%	1%	1%
Bryozoa:					
Membranipora membranacea	1%			1%	
other encrusting bryozoans	1%	1%	1%		1%
Crustaceans:					
Cancer pagurus	n1			n1	
Galathea squamifera	n2		n1	n1	n5
Paguridae sp.	n1	n1			
Echinoderms:					
Luidea ciliaris			n1	n1	
Ophiothrix fragilis					n2
Brittlestar unidentified		n1			
Molluscs:					
Gibbula cineraria			n4		n1
Gibbula umbillicalis		n2			
Nassarius pygmaeus			n2	n1	n1
Littorina obtusata/fabalis					n1
Rissoa parva	>100				
Sponges:					
Grantia compressa					n2
orange encrusting sponge	<1%	1%	1%	2%	1%
other encrusting sponges		2%	1%		1%
Algae /plants / lichens					
Brown algae:					
Bifurcaria bifurcata	25%	2%	1%	40%	2%
Ectocarpus sp.			2%		2%
Fucus serratus	5%				
Himanthalia elongata	10%	60%	90%	40%	100%
Laminaria saccharina	5%				20%
Leathesia marina	1%	1%	1%	1%	

Table continued…

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Coralline algae:					
Corallina officianalis	1%		4%	10%	
Lithothamnion sp	2%	10%		5%	5%
Mesophyllum lichenoides	8%	40%		15%	10%
Green algae:					
Cladophora rupestris					1%
Ulva lactuca	10%	5%	15%	1%	15%
Red algae:					
Audouinella sp.				1%	
Ceramium sp.	5%	10%	2%	5%	1%
Chondracanthus acicularis		10%			
Chondrus crispus	2%				10%
Furcellaria sp			5%	5%	
Gelidium sp		<1%		2%	
Gracilaria gracilis	5%	3%			
Hildenbrandia rubra	2%	1%	1%	2%	
Mastocarpus stellatus	15%	10%	20%	2%	10%
Polyides rotundus	2%	1%	2%		10%

Site: Old Town, east
Surveyors: J. Bussell, S. McNair, W. Smyth

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4
Animal species				
Anemones:				
Actinia equina	n1			
Anemonia viridis	n1			
Anthopleura ballii		n1		
Aulactinia verrucosa	n10			
Hildenbrandia rubra	2%		1%	1%
Annelids:				
Arenicola marina	n4			
Nereis sp.	n1			
Spirorbis sp.		1%	1%	5%
Ascidians:				
Aplidium pallidum		1%	2%	
Aplidium proliferum	1%		1%	
Botryllus scholosseri			1%	
encrusting seasquirts	2%			
Bryozoa:				
Turbicellepora magnicostata	1%			
Other encrusting bryozoans	1%		1%	
Crustaceans:				
Galathea squamifera	n1			
Xantho incisus	n1			
Echinoderms:				
Asterina gibbosa				n1
Luidia ciliaris		n2		
Brittlestar unidentified				n2
Fish:				
Lipophrys pholis		n1		
Jellyfish:				
Lucernariopsis cruxmelitensis		n1		
Molluscs:				
Calliostoma zizyphinum			n3	
Gibbula cineraria	n3		n1	
Gibbula umbillicalis	n4			1%
Littorina obtusata/fabalis		n1		
Rissoa sp.	n1	n1	>100	
Sponges:				
Sycon ciliatum			n1	n5
orange encrusting sponge				10%

Table continued…

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4
Algae /plants / lichens				
Brown algae:				
Himanthalia elongata	70%	30%	40%	40%
Saccharina latissima	40%		30%	20%
Sargassum muticum		2%		1%
Coralline algae:				
Corallina officianalis	1%	1%	5%	2%
Lithothamnion sp.	25%	2%	2%	15%
Green algae:				
Cladophora rupestris	1%			
Ulva sp.		2%	3%	5%
Red algae:				
Audouinella sp.			5%	
Chondracanthus acicularis		65%		20%
Chondrus crispus	10%	1%	15%	10%
Gigartina pistillata			15%	
Heterosiphonia plumosa	1%	1%		
Mastocarpus stellatus				10%
Osmundea pinnatifida			20%	
Polyides rotundus		1%	5%	5%
Vertebrata lanosa	1%			

Site: Old Town, west
Surveyors: I. Reach, R. Pipkin, A. Gall

Species	Quadrat 1	Quadrat 2
Animal species		
Anemones:		
Anemonia viridis		n1
Aulactinia verrucosa	n2	n2
Annelids:		
Harmothoe sp.		n1
Spirorbis sp.		2%
Ascidians:		
Aplidium pallidum		1%
Aplidium proliferum		1%
encrusting seasquirts		1%
Bryozoa:		
other encrusting bryozoans		<1%
Crustaceans:		
Callochiton septemvalvis		n1
Galathea squamifera		n1
Echinoderms:		
Ophiothrix fragilis	n2	
Luidia ciliaris	n5	
Molluscs:		
Gibbula cineraria		n8
Gibbula umbillicalis	n1	
Rissoa parva		n1
Sponges:		
Terpios fugax		1%
Algae /plants / lichens		
Brown algae:		
Bifurcaria bifurcata		2%
Himanthalia elongata	2%	
Leathesia marina	4%	2%
Saccharina latissima	1%	
Green algae:		
Ulva lactuca	10%	5%
Red algae:		
Chondracanthus acicularis	30%	40%
Gracilaria gracilis	5%	3%
Hildenbrandia rubra	2%	
Mastocarpus stellatus		4%
Osmundea pinnatifida		2%
Polyides rotundus	10%	5%
Pycnogonid unidentified	n1	

Site: Porth Loo
Surveyors: A. Gall, R. Pipkin, R. Williams

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4
Animal species				
Anemones:				
Actinia equina	n3			
Aulactinia verrucosa	n6	n2		n5
Annelids:				
Arenicola marina			n2	n1
Harmothoe sp.	n1	n1		
Spirobis sp.	40%	50%	30%	20%
Polychaete unidentified	n2			
Ascidians:				
Aplidium pallidum				<1%
Aplidium proliferum	2%	1%	2%	
Botryllus scholosseri	1%		<1%	
Corella eumyota		n1		
Didemnum sp	7%	20%	40%	10%
Morchellium argus	n2		n1	
Polyclinum aurantium	<1%		2%	
peach encrusting seasquirt unidentified	2%	1%		<1%
encrusting seasquirts unidentified			1%	
Bryozoa:				
Turbicellepora magnicostata	20%			
Crustaceans:				
Cancer pagurus		n1	n1	
Galathea squamifera	n4	n7	n1	n5
Palaemon serratus	n1			
Porcellana platycheles	n1	n2		n1
Xantho hydrophilus			n1	
Xantho pillipedes		n1		
Amphipoda unidentified		n5		n1
Isopod unidentified			n2	n1
Paguridae unidentified			n1	n1
Echinoderms:				
Asterina gibbosa		n2	n2	n1
Asterina phylactica	n1		n1	
Luidia ciliaris	n1			
Ophiothrix fragilis	n3		n2	n4
Fish:				
Lepadogaster lepadogaster			n2	
Nerophis lumbriciformis			n1	

Table continued…

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4
Molluscs:				
Calliostoma zizyphinum	n5		n1	
Gibbula cineraria	n4	n1	n20	n14
Mytilus sp.	n1			
Polyplacophora sp		n1		
Tricolia pullus			n1	
Sea spider:				
Pycnogonid	n1		n1	
Sponges:				
Ophlitaspongia papilla	5%			
Caprellidae unidentified	n1			
Porifera unidentified crusts	40%	30%	2%	5%
Algae /plants / lichens				
Brown algae:				
Bifurcaria bifurcata				5%
Halopteris filicina		<1%		
Himanthalia elongata	70%	60%	75%	80%
Sacchoriza polyschoides			5%	
Coralline algae:				
Corallina sp	<1%	1%	2%	1%
Mesophyllum lichenoides	3%	7%		5%
pink encrusting algae	10%	20%	30%	50%
Green algae:				
Bryopsis plumosa				<1%
Cladophora sp.	1%	<1%	2%	2%
Codium sp.		1%		
Cystoseira tamariscifolia	1%	10%		
Ulva lactuca	<1%		10%	5%
Red algae:				
Asparagopsis armata	<1%	2%	3%	1%
Audouinella sp.	50%	50%	40%	
Ceramium sp.	1%		<1%	
Chondracanthus acicularis	2%	2%	2%	3%
Chondrus crispus				5%
Cladostephus spongiosus		<1%		
Gastroclonium ovatum	2%	1%	2%	1%
Gymnogongrus crenulatus	25%	5%	10%	
Heterosiphonia plumosa			2%	
Hildenbrandia rubra	1%		1%	5%
Mastocarpus stellatus			5%	
Osmundea osmunda	3%	5%	15%	
Polysiphonia sp.			5%	2%

Site: Appletree Point, Tresco
Surveyors: I. Reach, J. Love, S. McNair

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Animal species					
Anemones:					
Aiptasia mutabilis	n1				
Anemonia viridis	n3	n7		n1	n9
Anthopleura ballii	n1	n17	n28	n2	n1
Aulactinia verrucosa	n3	n1			n3
Cereus pedunculatus	n2		n1		
Sagartia elegans	1				
Urticina felina	n2	n1			
Annelids:					
Spirorbis sp.	<1%				
Ascidians:					
Aplidium pallidum	5%	15%	15%	10%	5%
Aplidium proliferum			1%	2%	<1%
Botrylloides leachii				1%	
Aplidium elegans		1%	2%		<1%
colonial ascidian unidentified	<1%				
Bryozoa:					
Alcyonidium sp.					1%
Crisia sp.	1%	<1%			
Electra pilosa		<1%		1%	2%
Turbicellepora magnicostata		1%		2%	5%
Crustaceans:					
Cancer pagurus				n1	
Galathea squamifera				n1	
Necora puber				n1	
Paguridae unidentified		n2	n1		
Echinoderms:					
Luidia ciliaris				n1	
Ophiothrix fragilis	n1				
Molluscs:					
Calliostoma zizyphinum	n1				
Cerastoderma edule					n1
Gibbula umbillicalis					n2
Nassarius pygmaeus					n1
Tectura virginea					n1
Amphipoda unidentified	n1				
Sponges:					
Hymeniacidon perlevis		2%	2%		
Ophlitaspongia papilla		2%			1%
Terpios fugax		1%			
other encrusting sponges		2%	5%		

Table continued…

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Algae /plants / lichens					
Brown algae:					
Bifurcaria bifurcata		20%	40%	30%	40%
Ectocarpus sp.	2%		2%	2%	2%
Himanthalia elongata	95%	50%	95%	25%	75%
Leathesia marina		<1%		5%	<1%
Sargassum muticum	5%			5%	
Coralline algae:					
Corallina officinalis	1%	1%		5%	10%
Lithothamnion sp	5%			10%	
Mesophyllum lichenoides	1%			10%	2%
Green algae:					
Cladophora sp.	<1%				
Cladophora rupestris					<1%
Ulva intestinalis			1%	<1%	
Ulva sp.	10%	15%	2%	15%	
Red algae:					
Asparagopsis armata	5%	2%	5%	10%	
Ceramium sp.		1%	1%		<1%
Chondracanthus acicularis	1%	2%	5%	2%	2%
Chondrus crispus	5%				
Gelidium spinosum	<1%	1%			
Gelidium pusillum		<1%	<1%	1%	2%
Gigartina sp.	1%				2%
Lomentaria articulata	1%				2%
Mastocarpus stellatus	10%	30%	1%	30%	15%
Osmundea osmunda		<1%	1%	1%	
Vertebrata lanosa		1%	1%	5%	

Site: Plumb Island, Tresco
Surveyors: J. Bussell, R. Pipkin, W. Smyth

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Animal species					
Anemones:					
Actinia equine					n2
Aulactinia verrucosa		n1			
Annelids:					
Polychaete unidentified		n1	n1	n1	n4
Pomatoceros unidentified					n2
Spirorbis spirorbis	10%	10%	5%	5%	15%
Spirorbis sp.	25%		20%	10%	70%
Ascidians:					
Aplidium proliferum				1%	1%
Botryllus scholosseri			1%		1%
Dendrodoa grossularia	1%	1%	1%		1%
Bryozoa:					
Alcyonidium gelatinosum			1%		
Electra pilosa				1%	
Bryozoa unidentified (crusts)		2%		1%	2%
Crustaceans:					
Carcinus maenas	n2	n1	n3		n4
Porcellana platycheles	n1	n10	n15		n50
Xantho hydrophilus					n1
Amphipoda unidentified	n1	n5			
Echinoderms:					
Asterina gibbosa	n1	n1		n1	n2
Ophiuridae unidentified			n1		n1
Fish:					
Nerophis lumbriciformis					n1
Molluscs:					
Calliostoma zizyphinum			n1	n1	n4
Gibbula cineraria	n2				
Gibbula umbillicalis	n10	n1	n4	n20	n10
Nassariussp.			n4		n3
Lacuna vincta	n1	n5			
Littorina obtusata/fabalis	n20	n20	n10	n12	n20
Nucella lapillus	n1	n1			n1
Patella vulgata					n7
Polyplacophora sp.				n1	
Turritellidae unidentified		n1			
Sponges:					
Porifera unidentified crusts	1%				1%
other encrusting sponges	1%	3%			1%

Table continued…

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Algae /plants / lichens					
Brown algae:					
Ectocarpus sp.	1%		1%	5%	
Fucus serratus	100%	100%	100%	95%	100%
Coralline algae:					
Lithothamnion sp.	5%	10%		20%	50%
Green algae:					
Ulva sp.				<1%	
Red algae:					
Audouinella sp.	5%			20%	
Chondracanthus acicularis					<1%
Chondrus crispus	2%	1%	25%	2%	5%
Hildenbrandia rubra				2%	
Lomentaria articulata				<1%	
Rhodophyceae unidentified				1%	

Site: English Island Point, St Martin's
Surveyors: Ian Reach, Sangeeta McNair

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Animal species					
Anemones:					
Anemonia viridis	n10	n7	n9	n11	n5
Anthopleura balli				n25	
Aplidium pallidum	2%	3%	1%	30%	3%
Aplidium proliferum					<1%
Aulactinia verrucosa	n1	n1	n3	n2	
Sagartiogeton sp.			n1		
Urticina felina	n1				
Annelids:					
Pomatoceros triqueter					<1%
Spirorbis sp.	1%				1%
Ascidians:					
Aplidium pallidum	2%	3%	1%	30%	3%
Aplidium proliferum					<1%
Bryozoa:					
Crissia sp	2%	1%	5%	15%	1%
Electra pilosa	2%	1%	2%	2%	10%
Membranapora membranacea	1%				
Turbicellepora magnicostata				1%	
other encrusting bryozoans				1 %	
Crustaceans:					
Amphipoda indet				n2	
Paguridae indet			n1		
Sphaeroma indet		n1			
spider crab indet	n2				
Fish:					
Lepadogaster lepadogaster			n1		
Jellyfish:					
Lucernariopsis campanulata			n1		
Molluscs:					
Gibbula cineraria				n1	
Gibbula umbillicalis		n6	n10	n1	n10
Hinia pygmaea	n1				
Osmundea pinnatifida					<1%
Tricolia pullus			n1		
Opisthobranchia indet		n1			
Sea spider:					
Pycnogonid	n10				
Sponges:					
other encrusting sponges				2%	

Table continued…

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Algae /plants / lichens					
Brown algae:					
Ectocarpus sp		2%	2%		
Himanthalia elongata	95%	50%	90%	30%	10%
Saccharina latissima		5%		20%	
Sargassum muticum		2%			
Coralline algae:					
Corallina officianalis				3%	
Lithothamnion sp		1%	5%	2%	5%
Green algae:					
Cladophora sp.					1%
Ulva sp			1%		<1%
Red algae:					
Asparagopsis armata	1%		1%		
Audouniella sp.		5%	3%		5%
Chondracanthus acicularis			1%		1%
Gigartina pistillata	3%				
Hildenbrandia rubra				1%	2%
Jania rubens	1%	1%	5%	1%	1%
Mastocarpus stellatus	2%	15%	20%	40%	20%
Polyides rotundus	1%	<1%	2%	1%	
Polysiphonia lanosa		3%			1%
Rhodymenia pseudopalmata			<1%		

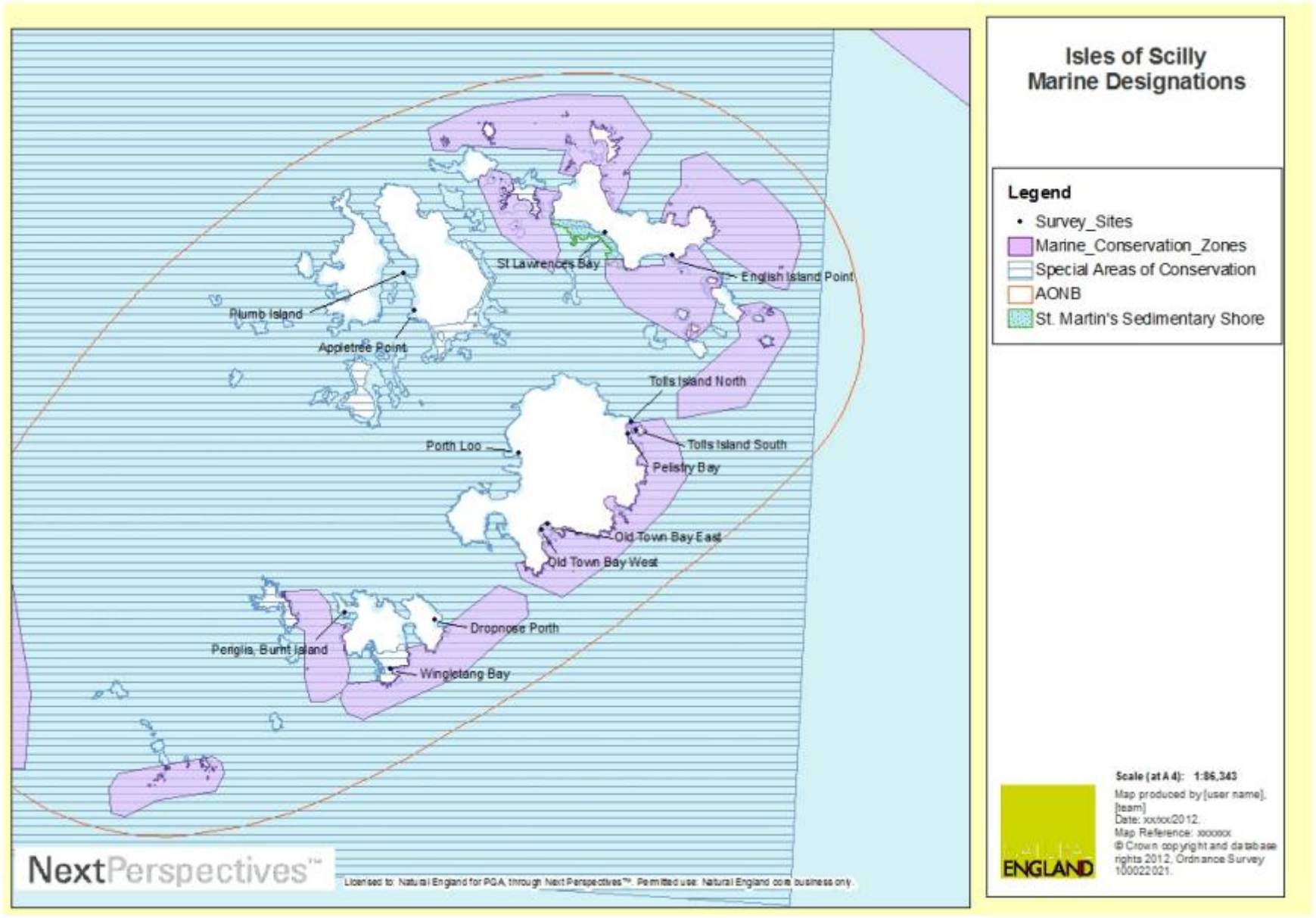
Site: St Lawrence's Bay, St Martin's
Surveyors: J. Bussell, W. Smyth

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Animal species					
Anemones:					
Actinia equina			n2	n3	n1
Aulactinia verrucosa				n2	
Cereus pedunculatus					n1
Annelids:					
Alentia gelatinosa				n1	n4
Ampharatidae	n3				
Nemertea sp	n1				
Spirorbis spirorbis	5%		10%	30%	90%
Spirorbis sp.		1%	2%		
Ascidians:					
Aplidium pallidum			1%		
Aplidium proliferum			1%		
Aplidium elegans			n1		
Didemnid unidentified					1%
encrusting seasquirts			1%	10%	
Bryozoa:					
Turbicellepora magnicostata			1%		
other encrusting bryozoans		2%		5%	
Crustaceans:					
Carcinus maenas	n1	n1	n2	n1	n1
Galathea squamifera			n1		n4
Pisidia longicornis					n2
Porcellana platycheles			n40	n1	n6
Xantho hydrophilus			n1		
Xantho pillipedes			n1		
Amphipoda unidentified		n4	n50	n1	
Paguridae unidentified				n1	
Echinoderms:					
Asterina gibbosa			n1	n1	
Asterina phylactica					n2
Ophiothrix fragilis				n1	
Ophiuroidea unidentified				n1	n4
Fish:					
Lepadogaster lepadogaster			n1		
Lipophrys pholis			n1	n1	n1
Insecta:					
Aepus robinii	n30				

Table continued…

Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5
Molluscs:					
Calliostoma zizyphinum			n2		
Gibbula umbillicalis	n3	n1	n1	3	n8
Nassariusreticulata					n1
Littorina obtusata/fabalis	n40	n30	n10	n5	n8
Patella vulgata			n12	n10	n9
Sponges:					
orange encrusting sponge			1%		
other encrusting sponges					1%
Algae /plants / lichens					
Brown algae:					
Ectocarpus sp	1%	30%	5%		5%
Fucus serratus	45%	40%	35%	40%	40%
Fucus vesiculosus	45%	60%	35%	40%	30%
Coralline algae:					
Lithothamnion sp	40%	40%	10%	10%	40%
Green algae:					
Ulva sp	10%			<1%	1%
Red algae:					
Audouinella sp.		1%	50%		
Chondrus crispus	1%	1%	30%		1%
Hildenbrandia rubra	1%	10%	1%	2%	
Hildenbrandia sp.		2%			
Lomentaria articulata			1%		
Mastocarpus stellatus	1%				

Appendix 4 Maps


Isles of Scilly
Marine Designations
Legend
Survey_Sites
Marine_Conservation_Zones
Special Areas of Conservation
AONB
St. Martin's Sedimentary Shore
St Lawrences Bay
English Island Point
Plumb Island
Appletree Point
Tolls Island North
Porth Loo
Tolls Island South
Pelistry Bay
Old Town Bay East
Old Town Bay West
Dropnose Porth
Penglis, Burnt Island
Wingletang Bay
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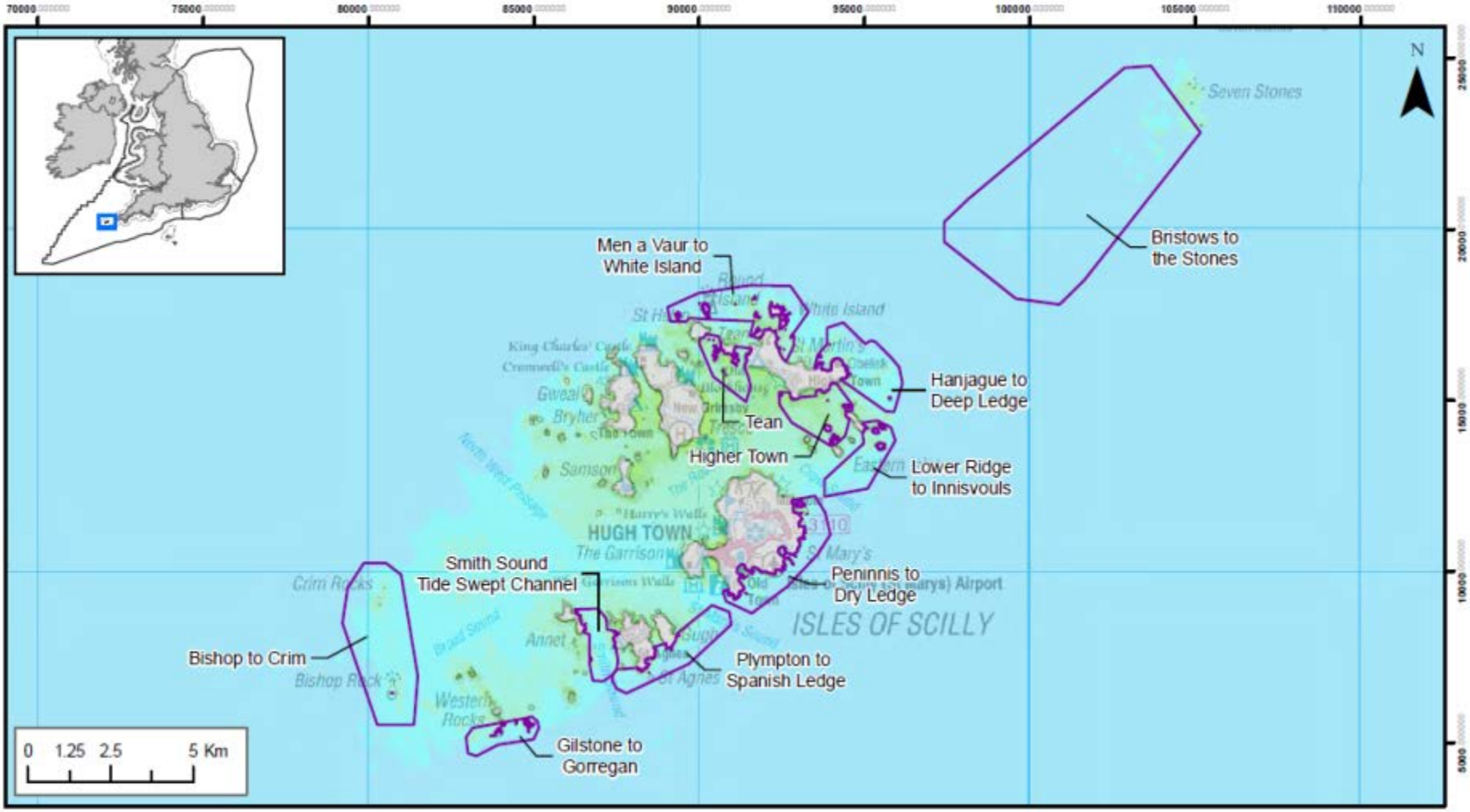


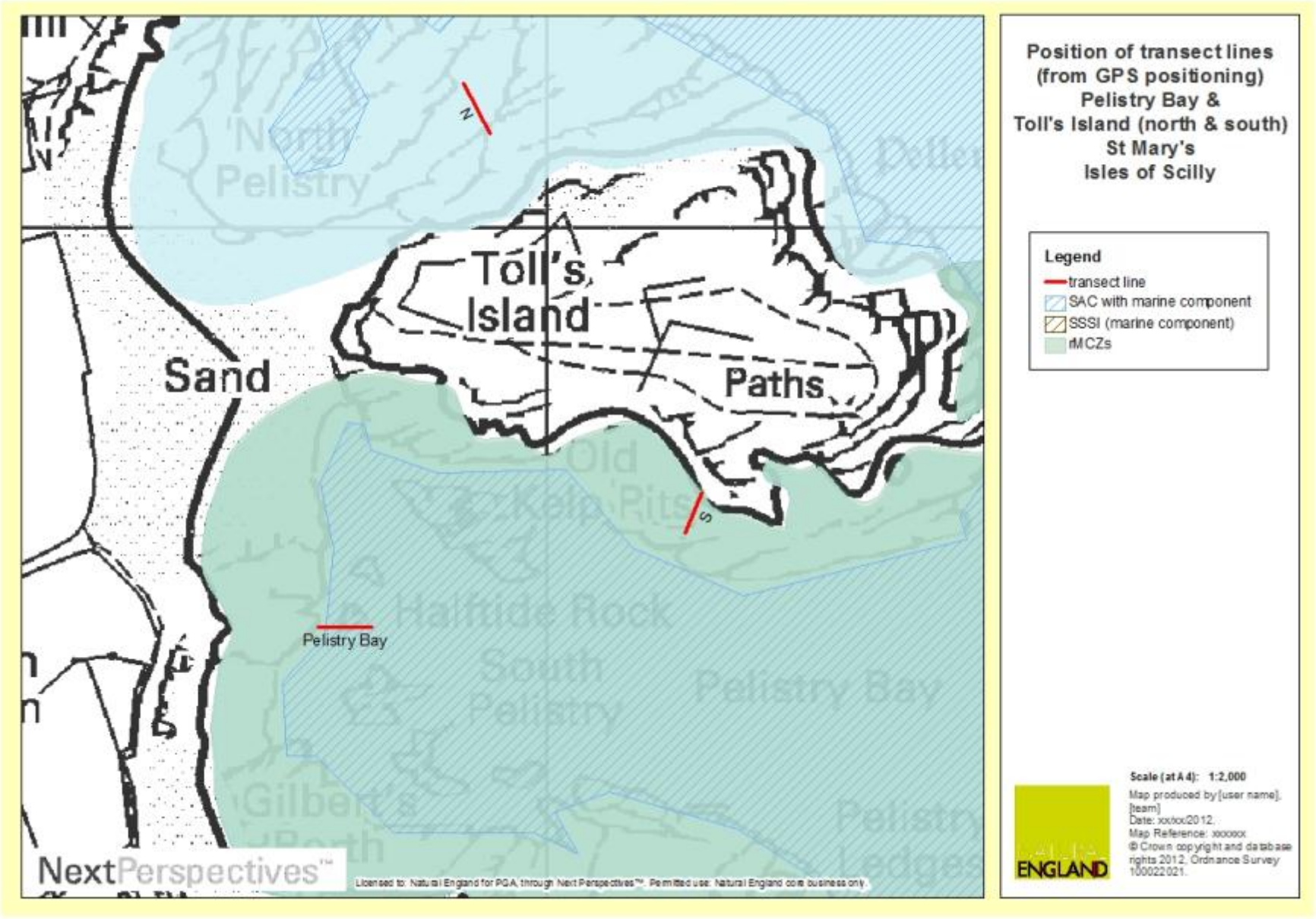
Isles of Scilly Sites MCZs Boundary Overview

- Marine Conservation Zone
- Regional MCZ project area
- 12nM Territorial Seas Limit
- Land

Depth Areas (m)

-20.0 - -10.0	25.1 - 50.0
-9.9 - -5.0	50.1 - 100.0
-4.9 - 0.0	100.1 - 250.0
0.1 - 5.0	250.1 - 500.0
5.1 - 10.0	500.1 - 1000.0
10.1 - 25.0	

Reference: Theme ID: 1477656
Map Projection: British National Grid


Position of transect lines
(from GPS positioning)
Pelistry Bay &
Toll's Island (north & south)
St Mary's
Isles of Scilly
Legend
transect line
SAC with marine component
SSSI (marine component)
rMCZs
Toll's Island
Sand
Paths
Pelistry Bay
N
S
Scale (at A4): 1:2,000
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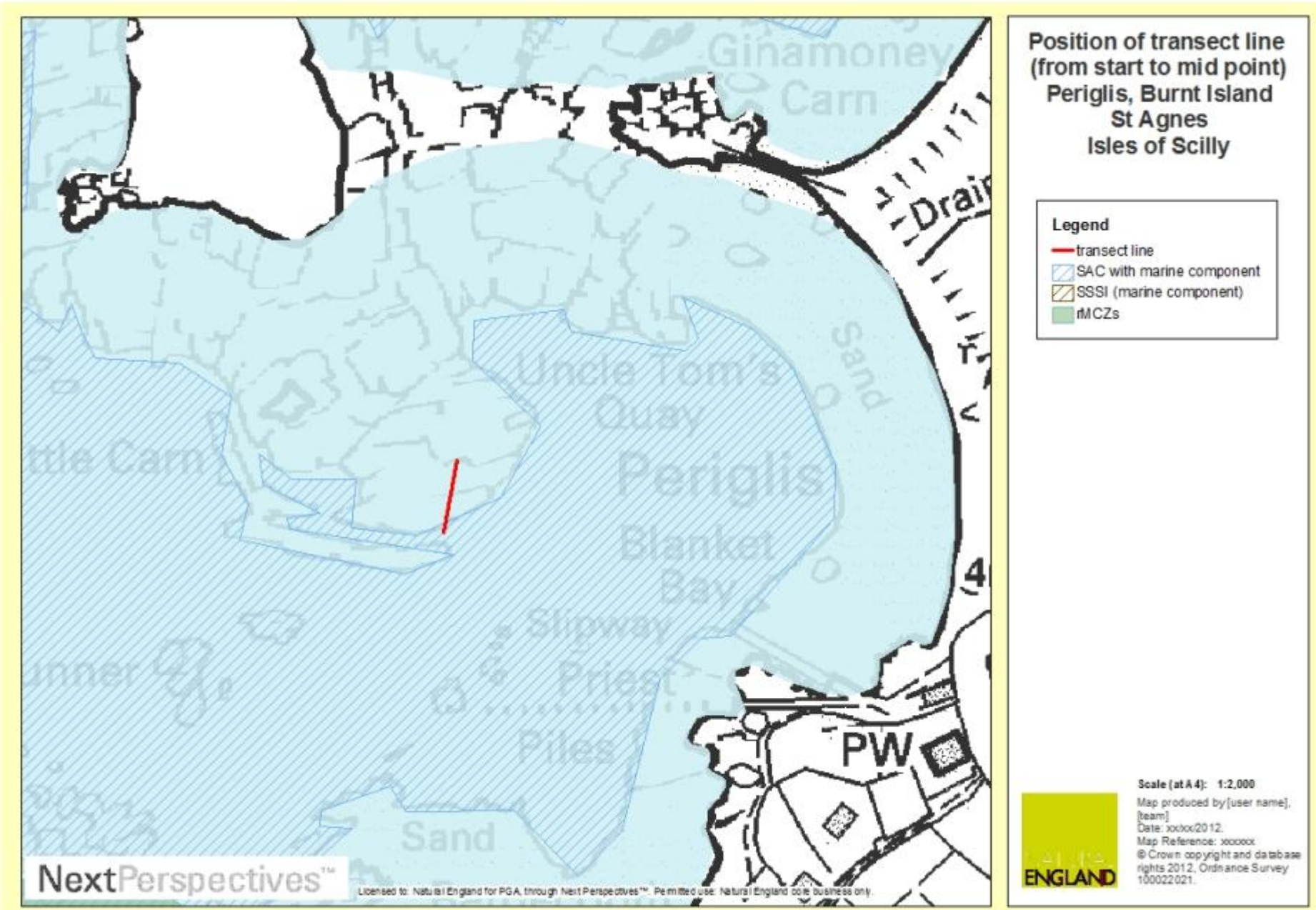
Position of transect line
(from start to mid point)
Periglis, Burnt Island
St Agnes
Isles of Scilly
Legend
transect line
SAC with marine component
SSSI (marine component)
rMCZs
Scale (at A 4): 1:2,000
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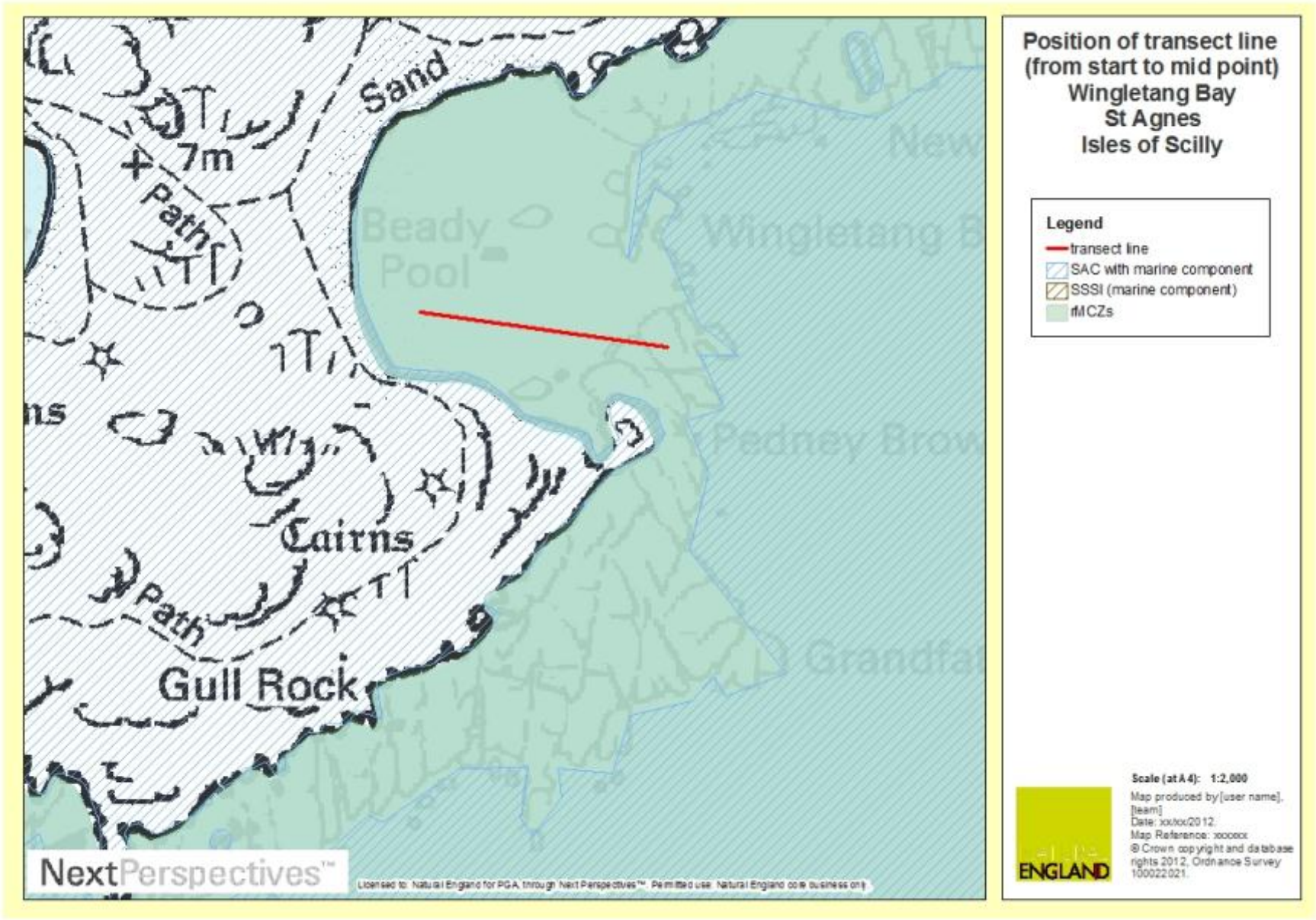
Periglis
Blanket Bay
Uncle Tom's Quay
Slipway
Priest
Piles
Sand
PW


Sand
7m
Path
Beady Pool
Wingletang B
Pedney Brow
Cairns
Path
Gull Rock
Grandfa
NextPerspectives™
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Position of transect line (from start to mid point)
Wingletang Bay
St Agnes
Isles of Scilly
Legend
transect line
SAC with marine component
SSSI (marine component)
rMCZs
ENGLAND
Scale (at A4): 1:2,000
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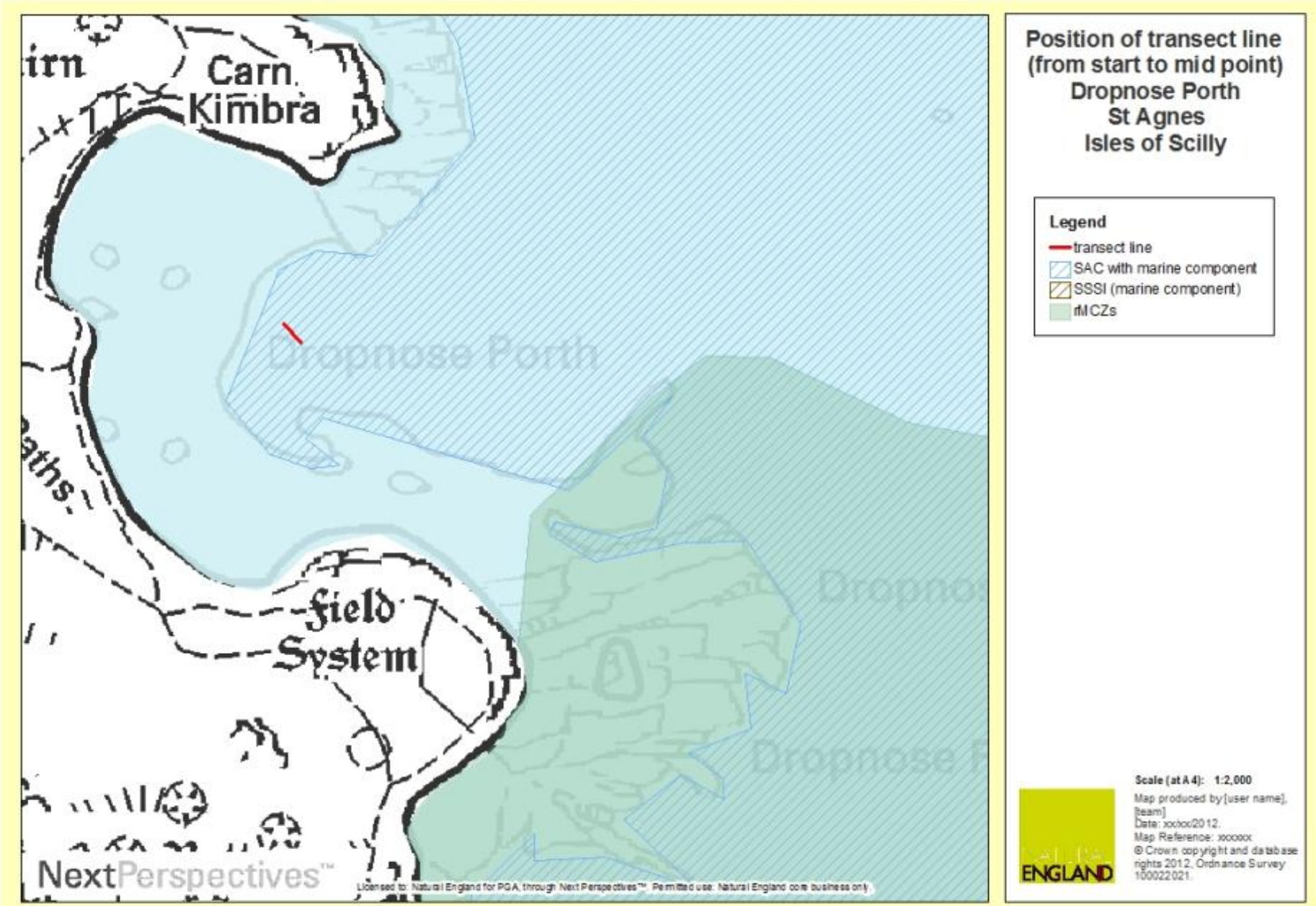
Carn Kimbra
Dropnose Porth
Field System
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Position of transect line
(from start to mid point)
Dropnose Porth
St Agnes
Isles of Scilly
Legend
transect line
SAC with marine component
SSSI (marine component)
rMCZs
ENGLAND
Scale (at A4): 1:2,000
Map produced by [user name], [team]
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Map Reference: xxxxxx
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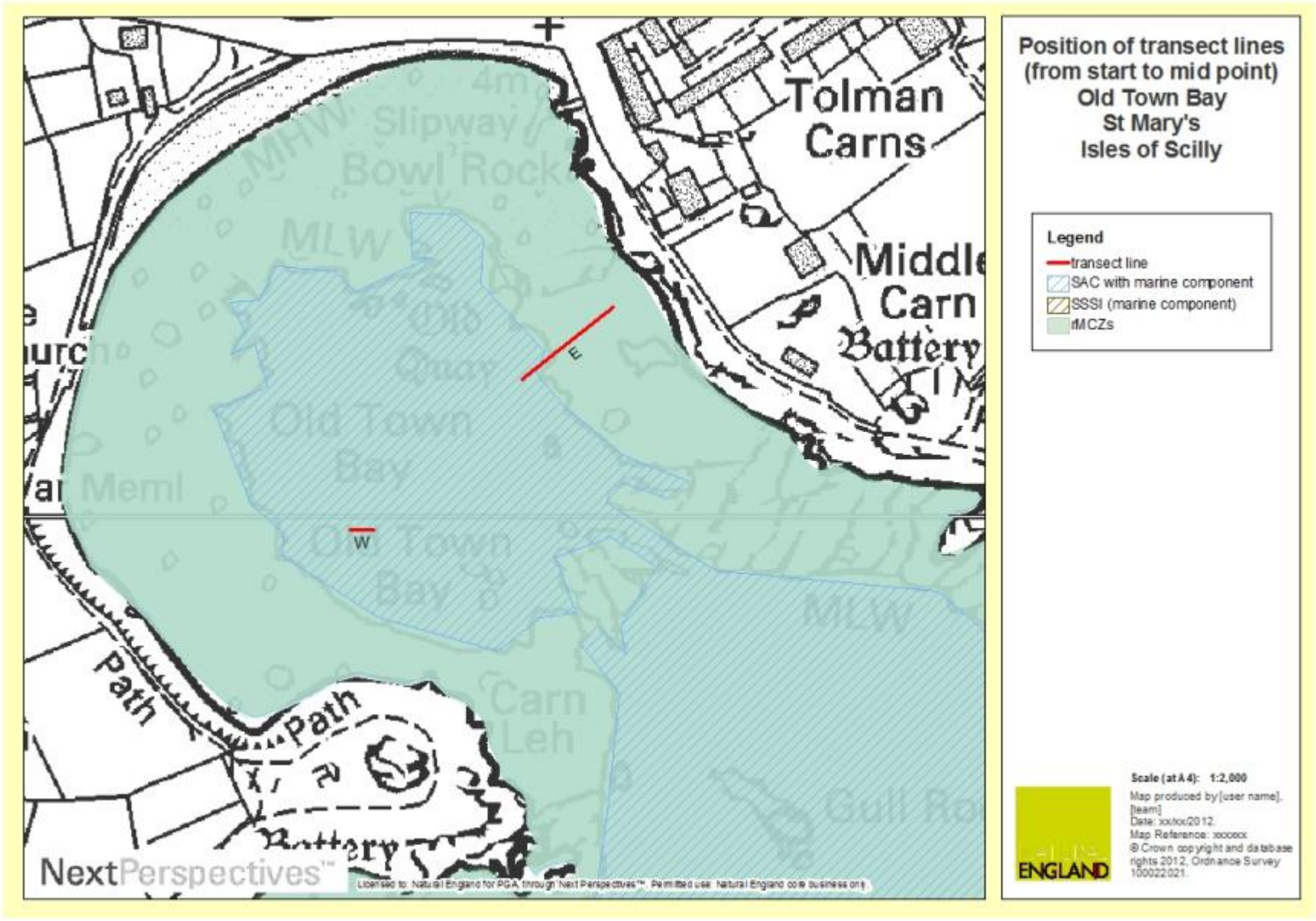
Position of transect lines
(from start to mid point)
Old Town Bay
St Mary's
Isles of Scilly
Legend
transect line
SAC with marine component
SSSI (marine component)
rMCZs
Tolman
Carns
Middle
Carn
Battery
Old Town Bay
E
W
Path
Path
Battery
Carn Leh
Gull Ro
MLW
MHW
Slipway
Bowl Rock
4m
Quay
Meml
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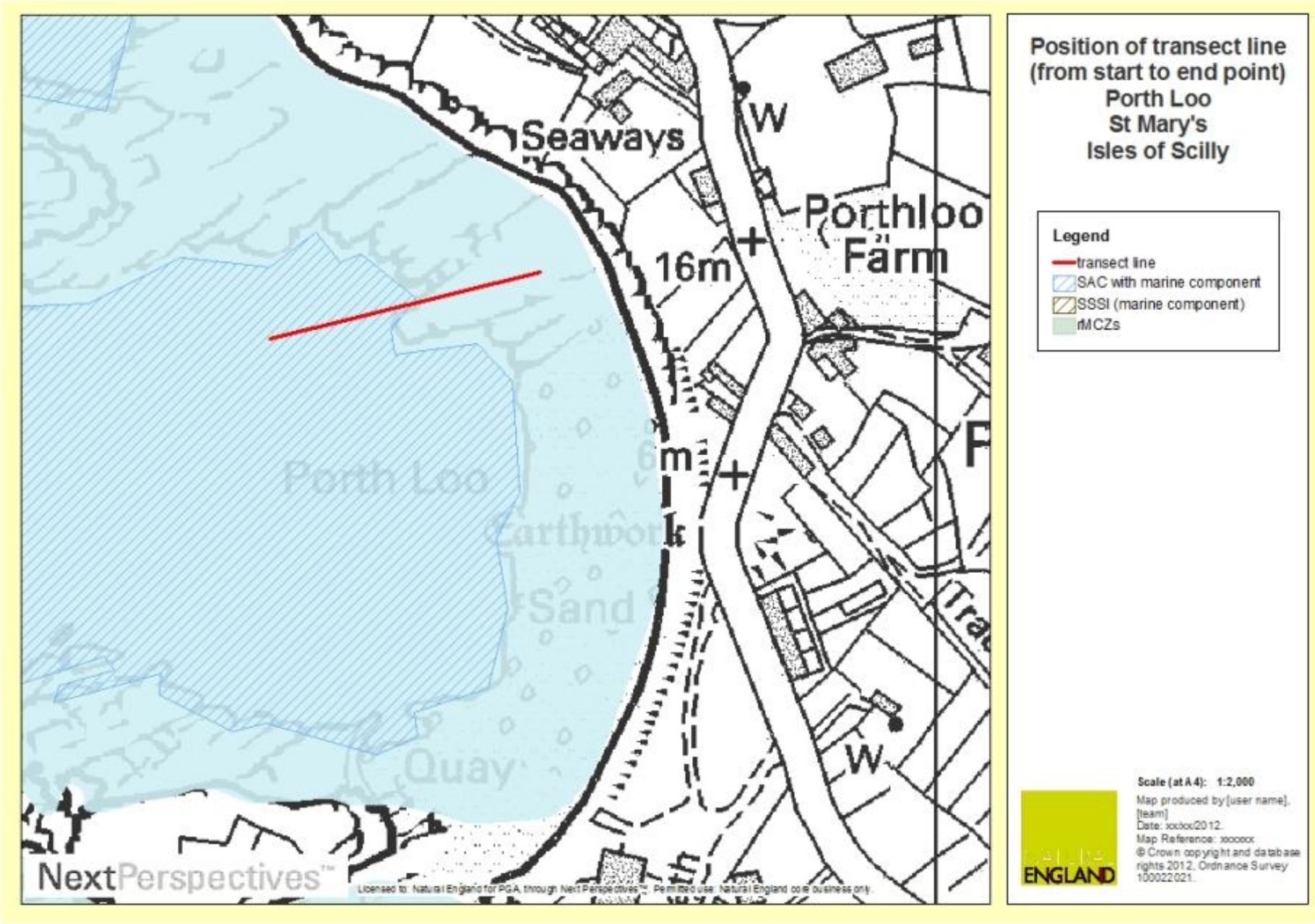
Seaways
Porthloo Farm
16m
Porth Loo
Sand
Quay
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Position of transect line
(from start to end point)
Porth Loo
St Mary's
Isles of Scilly
Legend
transect line
SAC with marine component
SSSI (marine component)
rMCZs
ENGLAND
Scale (at A4): 1:2,000
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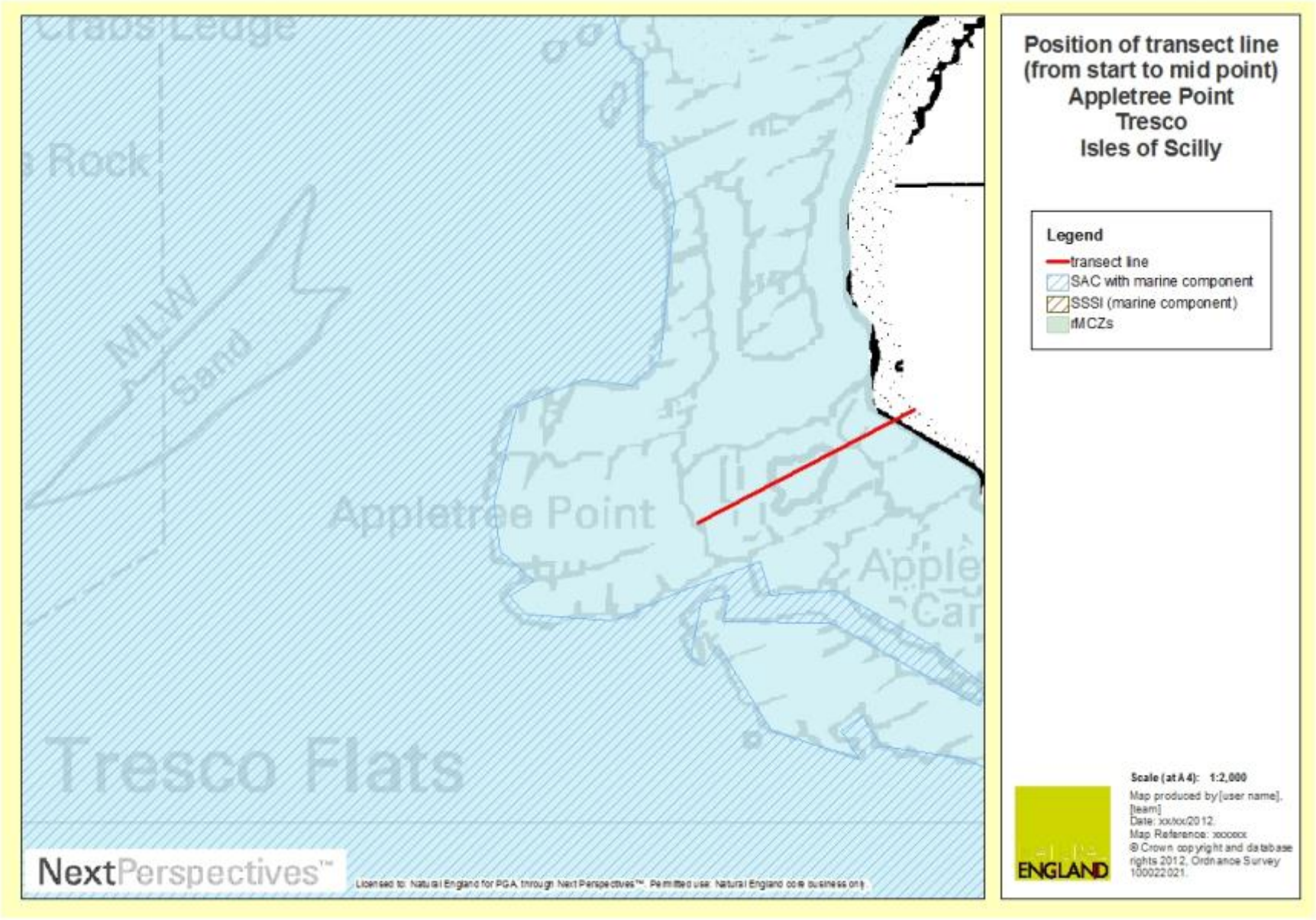
Position of transect line
(from start to mid point)
Appletree Point
Tresco
Isles of Scilly
Legend
transect line
SAC with marine component
SSSI (marine component)
rMCZs
Appletree Point
Tresco Flats
MLW
Sand
Rock
Scale (at A4): 1:2,000
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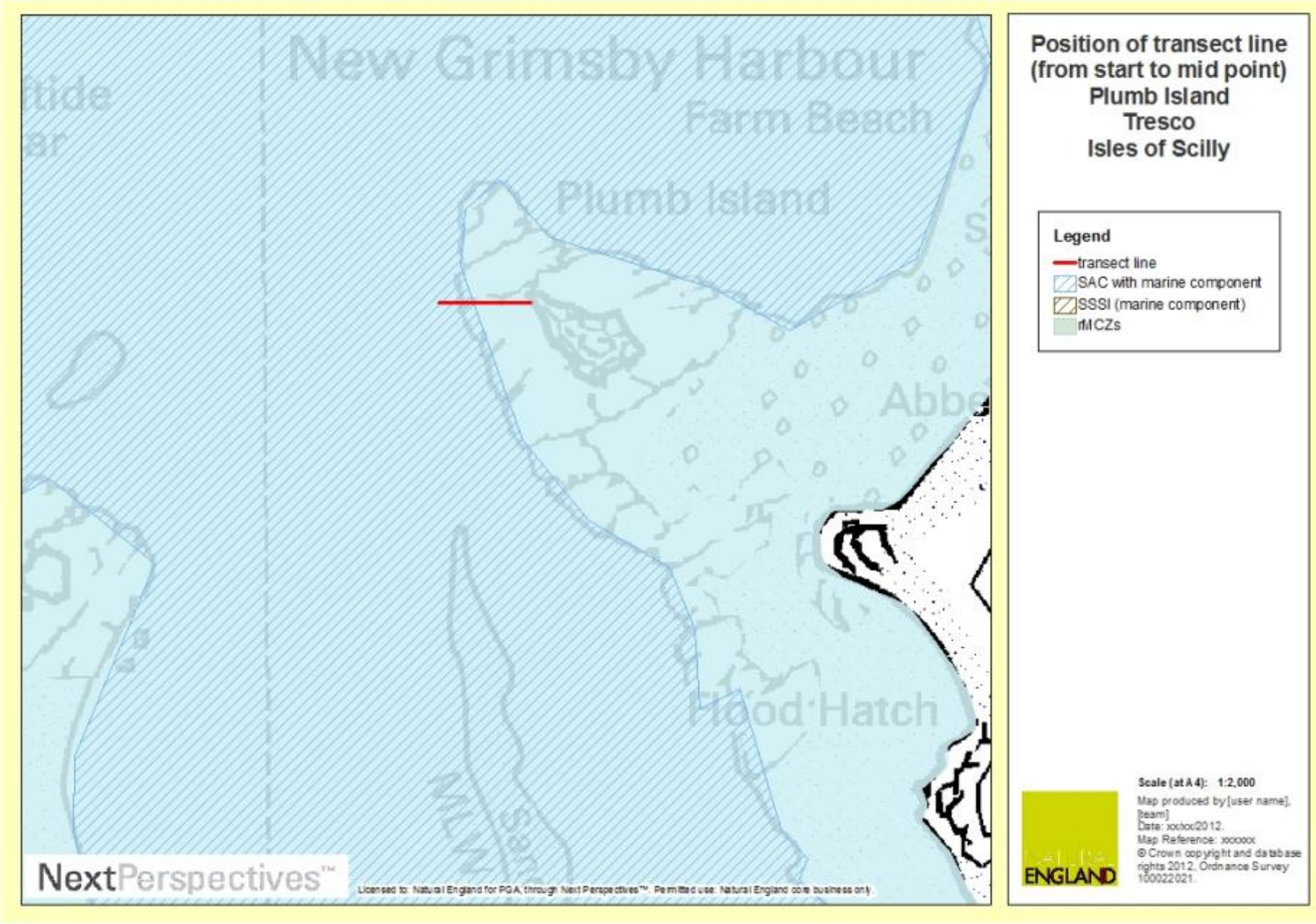
New Grimsby Harbour
Farm Beach
Plumb Island
Abbe
Flood Hatch
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Position of transect line
(from start to mid point)
Plumb Island
Tresco
Isles of Scilly
Legend
transect line
SAC with marine component
SSSI (marine component)
rMCZs
ENGLAND
Scale (at A4): 1:2,000
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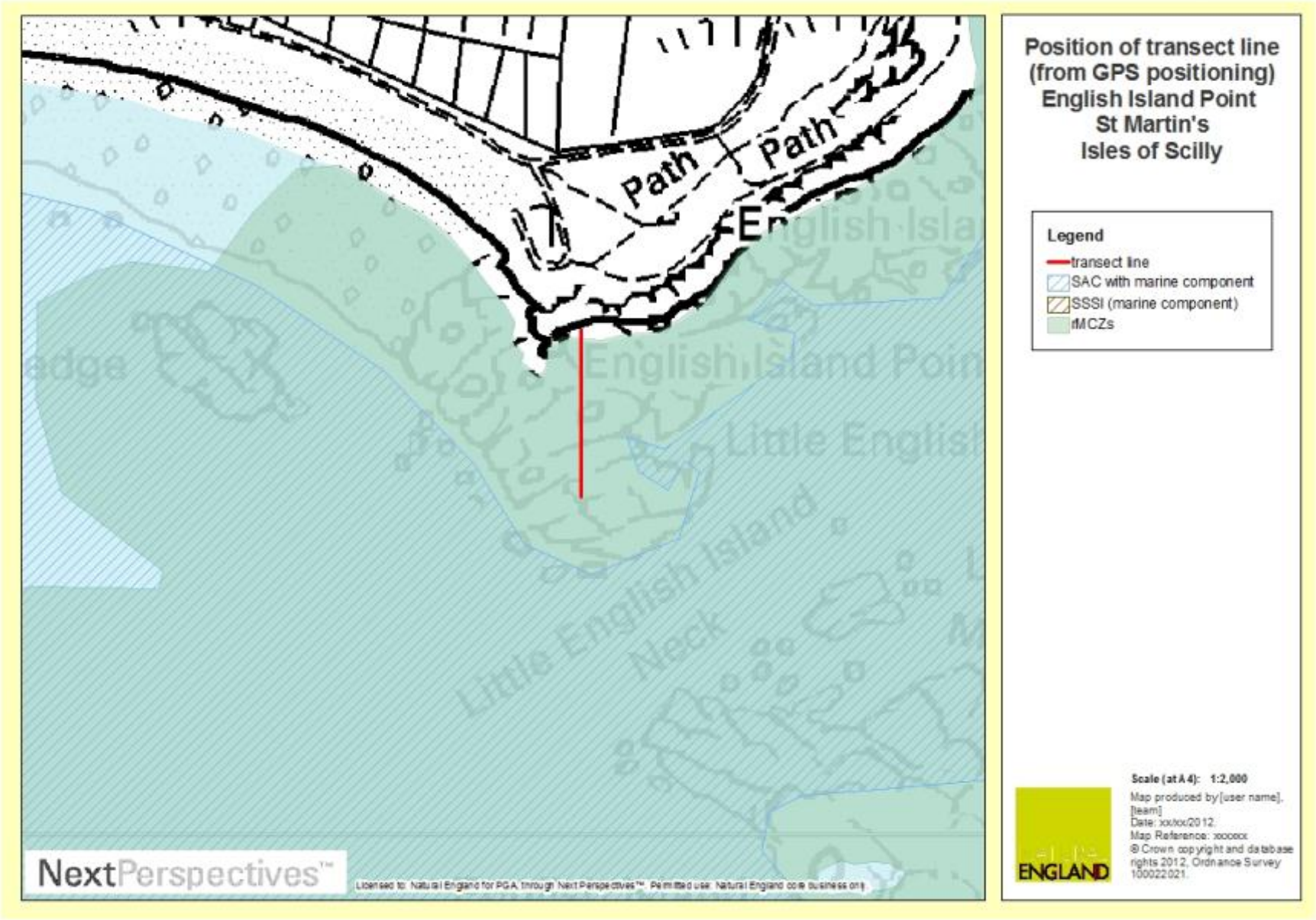
Path
Path
English Island Point
Little English Island
Little English Island Neck
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Position of transect line
(from GPS positioning)
English Island Point
St Martin's
Isles of Scilly
Legend
transect line
SAC with marine component
SSSI (marine component)
dMCZs
ENGLAND
Scale (at A4): 1:2,000
Map produced by [user name], [team]
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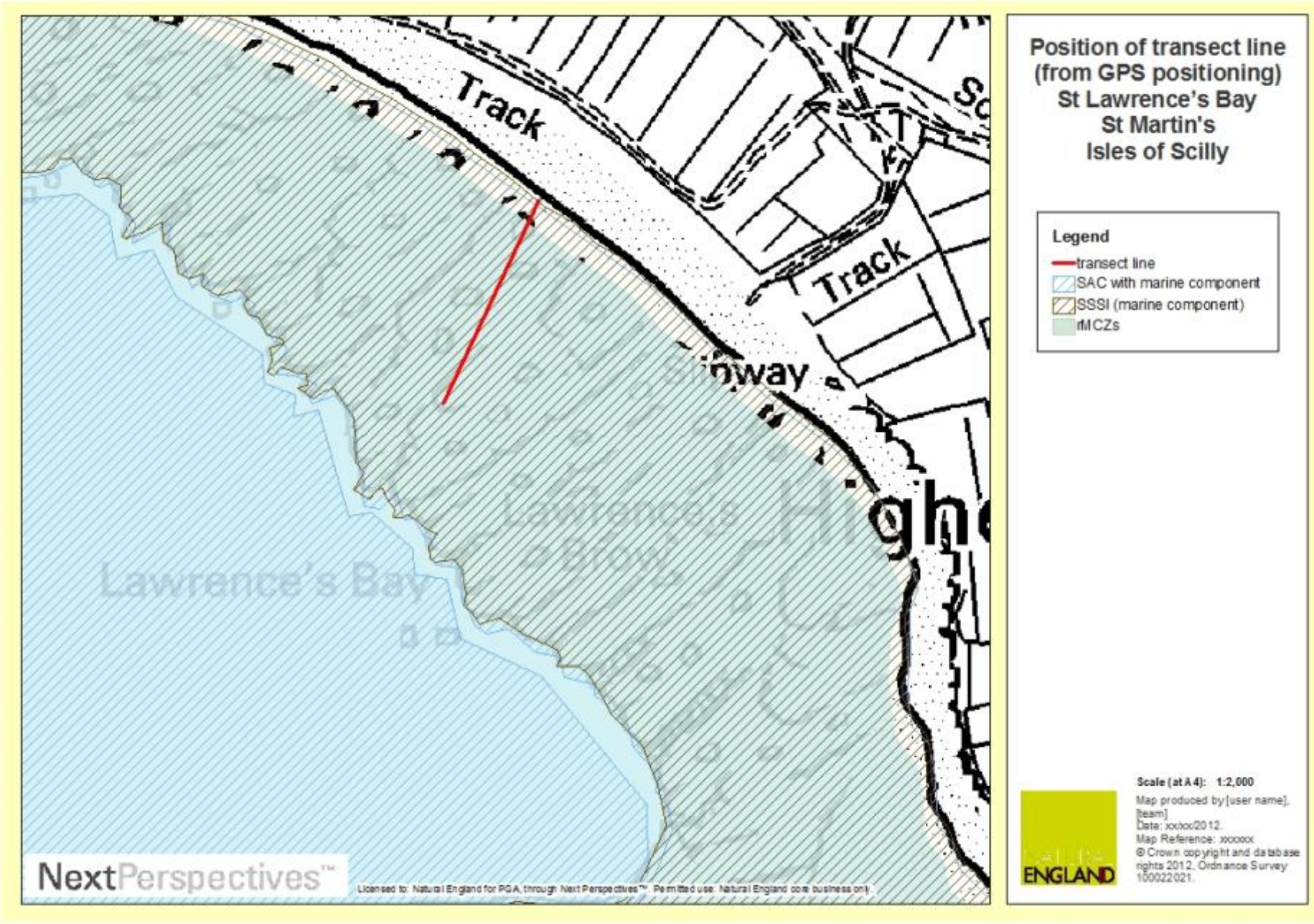
Track
Track
Position of transect line
(from GPS positioning)
St Lawrence's Bay
St Martin's
Isles of Scilly
Legend
transect line
SAC with marine component
SSSI (marine component)
rMCZs
Scale (at A4): 1:2,000
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Appendix 5 Location of Survey Point

Location name	Position coordinates (position at top of transect)	Position coordinates (position at bottom of transect)	Survey date	Surveyors
Periglis, Burnt Island, St Agnes	SV 87526 08424	SV 87520 08392	30.09.11	J. Bussell R. Pipkin
Wingletang Bay, St Agnes	SV 88391 07343	SV 88500 07328	30.09.11	I. Reach W. Smyth
Dropnose Porth, Gugh	SV 89242 08280	SV 89250 08272	30.09.11	S. McNair R. Williams
N Toll's Island, St Mary's	SV 92974 12042	SV 92962 12064	28.09.11	A. Gall R. Pipkin
S Toll's Island, St Mary's	SV 93067 11884	SV 93060 11866	28.09.11	I. Reach W. Smyth
E Old Town, St Mary's	SV 91387 10093	SV 91347 10061	27.09.11	J. Bussell S. McNair W. Smyth
W Old Town, St Mary's	SV 91271 09995	SV 91282 09995	27.09.11	I. Reach R. Pipkin A. Gall
Pelistry Bay, St Mary's	SV 92922 11825	none provided	29.09.11	J. Bussell S. McNair
Porth Loo, St Mary's	SV 90826 11463	SV 90708 11434	29.09.11	A. Gall R. Pipkin R. Williams
Appletree Point, Tresco	SV 88851 14182	SV 88755 14132	01.10.11	I. Reach J. Love, S. McNair
Plumb Island, Tresco	SV 88632 14875	none provided	01.10.11	J. Bussell R. Pipkin, W. Smyth
English Island Point, St Martin's	SV 93770 15222	none provided	29.09.11	I. Reach S. McNair
St Lawrence's Bay, St Martin's	SV 92480 15649	SV 92438 15560	29.09.11	J. Bussell W. Smyth

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