Inshore and Offshore Special Area of Conservation: Solan Bank Reef

SAC Selection Assessment Document

Version 5.0 (31st October 2012)

* Cover photo illustrates soft coral (*Alcyonium digitatum)*, common sea urchin (*Echinus esculentus)* and encrusting coralline algae on shallow circalittoral bedrock reef at Solan Bank Reef.

Introduction

This document provides detailed information about Solan Bank Reef and evaluates its interest features according to the Habitats Directive selection criteria and guiding principles.

The advice contained within this document is produced to fulfil requirements of Scottish Natural Heritage under The Conservation (Natural Habitats, & c.) Regulations 1994 (as amended) and JNCC under Part 2 of the Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2007 (as amended), relating to the conservation of natural habitat types and habitats of species through identification of Special Areas of Conservation (SACs) in UK offshore and inshore waters. Under these Regulations, JNCC and SNH have an obligation to provide certain advice to Scottish Government to enable the Secretary of State to fulfil his obligations under the Regulations, and to Competent Authorities to enable them to fulfil their obligations under the Regulations.

This document includes information required under Regulation 7 of the Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2007 (as amended), to enable the Secretary of State to transmit to the European Commission the list of sites eligible for designation as Special Areas of Conservation (SACs). JNCC and SNH have been asked by Scottish Government to provide this information.

Sites eligible for designation as offshore marine SACs are selected on the basis of the criteria set out in Annex III (Stage 1) to the Habitats Directive and relevant scientific information. Sites are considered only if they host a Habitats Directive Annex I habitat or Annex II species. Moreover, sites for Annex II species that are highly mobile must contain a clearly identifiable area that presents physical and biological factors essential to these species' life and reproduction to be eligible. Socio-economic factors are not taken into account in the identification of sites proposed to the European Commission[1].

In addition to information on the Annex I habitats and/or Annex II species hosted within the site, this document contains i) a chart of the site, ii) its name, location and extent, and iii) the data resulting from application of the criteria specified in Annex III (Stage 1) to the Habitats Directive. This is in line with legal requirements outlined under Regulation 7. JNCC has adhered to the format established by the Commission for providing site information. This format is set out in the 'Natura 2000 Standard data form' (CEC, 2011) (prepared by the European Topic Centre for Biodiversity and Nature Conservation on behalf of the European Commission to collect standardised information on SACs throughout Europe).

[1] Following European Court of Justice 'First Corporate Shipping' judgement C-371/98 (7 November 2000)

Document Version Control

Version and issue date	Amendments made	Issued to and date
SAC SAD Version 5.0 (31.10.2012)	Updated to Candidate SAC throughout	Scottish Government
SAC SAD Version 4.0 (31.08.2012)	Updated following public consultation and MPA SG comments – section 11 and links.	Scottish Government
SAC SAD Version 3.0 (05.03.2012)	Updated to possible SAC throughout	Public consultation
SAC SAD Version 2.0 (27.10.11)	Comments from Joint Committee incorporated, dates updated.	Scottish Government
SAC SAD Version 1.0 (01.09.11)	Comments from MPA Technical Group and MPA Sub Group incorporated. Text edits following comments by SNH. Proposed boundary edited.	Joint Committee (intersessionally)
SAC SAD version 0.1 (30.04.10)	Proposed site boundary defined; report drafted	MPA Technical Group 18.05.10

Further information

This document will be available on the JNCC website for download in due course (jncc.defra.gov.uk).

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Solan Bank Reef SAC: Selection Assessment Document

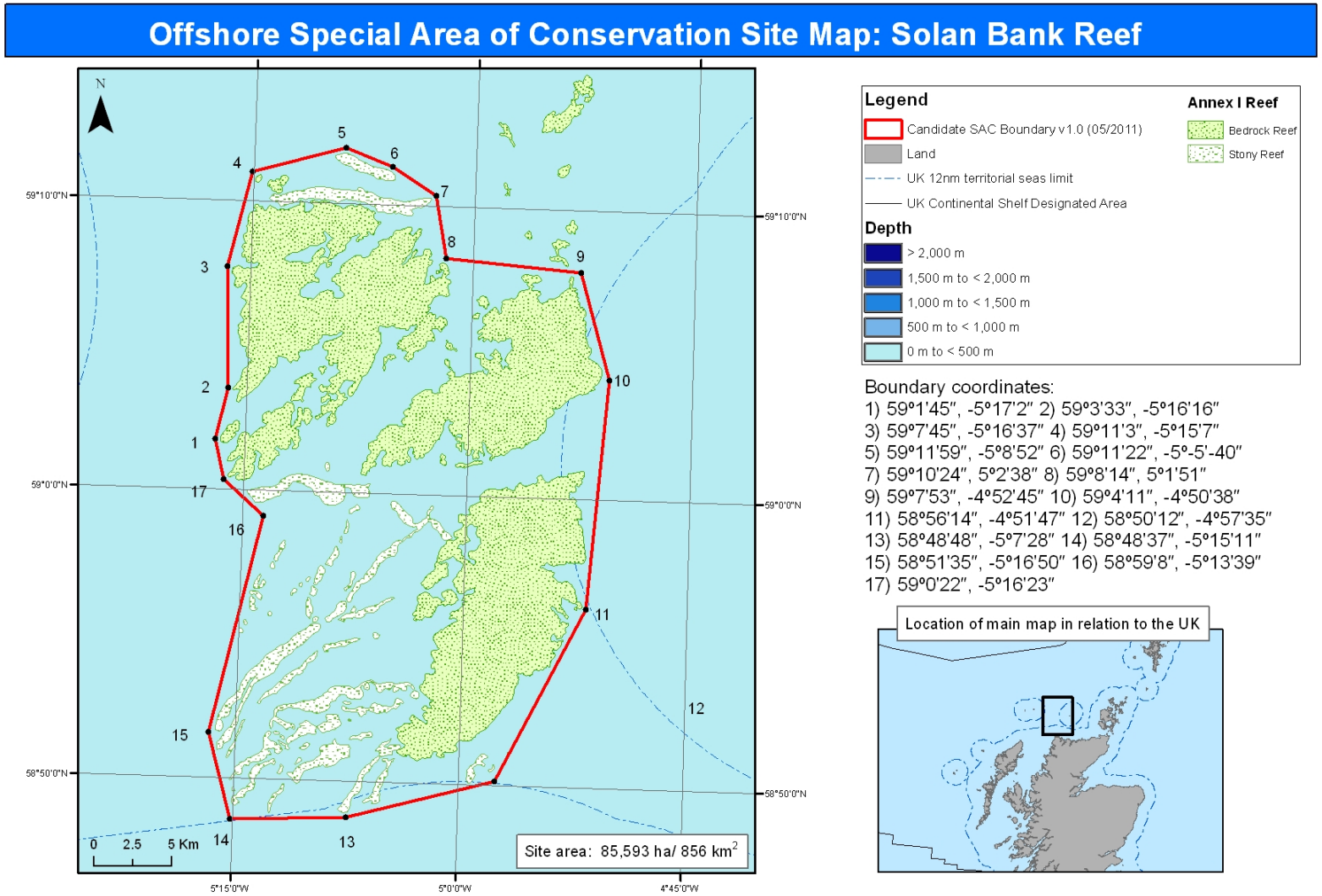
1 Site name	2 Site centre location
Solan Bank Reef	59º0'3″N, 5º4'48″W (Datum: WGS 1984)
3 Site surface area	**4 Biogeographic region**
85,593 ha / 856 km^2 (Datum: WGS 1984 UTM Zone 30 North, calculated in ArcGIS)	Atlantic

5 Interest features under the EU Habitats Directive

1170 Reefs

1135 Harbour porpoise (*Phocoena phocoena) (Non-qualifying)*
1364 Grey seal (*Halichoerus grypus) (Non-qualifying)*
1365 Harbour (common) seal (*Phoca vitulina) (Non-qualifying)*

6 Map of site



Boundary coordinates:
1) 59°1'45", -5°17'2" 2) 59°3'33", -5°16'16"
3) 59°7'45", -5°16'37" 4) 59°11'3", -5°15'7"
5) 59°11'59", -5°8'52" 6) 59°11'22", -5°-5'-40"
7) 59°10'24", 5°2'38" 8) 59°8'14", 5°1'51"
9) 59°7'53", -4°52'45" 10) 59°4'11", -4°50'38"
11) 58°56'14", -4°51'47" 12) 58°50'12", -4°57'35"
13) 58°48'48", -5°7'28" 14) 58°48'37", -5°15'11"
15) 58°51'35", -5°16'50" 16) 58°59'8", -5°13'39"
17) 59°0'22", -5°16'23"

Map projected in UTM (Zone 30N. WGS84 datum). World Vector Shoreline © US Defense Mapping Agency. NOT TO BE USED FOR NAVIGATION. The exact limits of the UK Continental Shelf are set out in orders made under section 1(7) of the Continental Shelf Act 1964 (© Crown Copyright). Map version number 1.2 (20/09/2012). Created by DB. Map copyright JNCC, 2012.

7 Site summary

Solan Bank Reef is located approximately 50km north of Cape Wrath on the Scottish mainland. The site lies in the vicinity of numerous geological structural features. It is located on the Solan Bank High, and surrounded by the Nun Rock-Sule Skerry and East Rona Highs and the North Rona, North Lewis, North Minch and West Orkney basins. The Solan Bank High is a Precambrian basement rock, 130km long and 25km wide, composed of metamorphic basement rocks with sands and clays (Stoker *et al,* 1993). The majority of the site lies in water depths of 60 – 80m. However to the south east of the site an outcrop of bedrock reef rises to approx 20m below the sea surface whilst the north of the site extends to >90m water depth.

The site represents the Annex I reef sub-types 'bedrock' and 'stony' reef. Bedrock outcrops create areas of high topography, with linear features, thought to be bedrock joint planes, forming cliffs with relief of up to 10m. In areas of bedrock where lineations are not as prominent, bedrock outcrops are smooth and undulating, forming features known as roches moutonnées (Sugden *et al,* 1992). Stony reef, comprised of boulders and cobbles with a sandy veneer, occurs in ridges to the north west and south west of the site. These features are present across the site and are likely to be glacial in origin, representing morainic ridges (Whomersley *et al,* 2010). Boulders and cobbles also occur in the larger crevices in the bedrock whilst smaller fissures in the bedrock are infilled with a mixture of coarse sand and shell gravel veneer. A veneer of sand is also present over the flat bedrock surfaces, indicating that sediment scour is a significant factor across the site.

The reefs are characterised by encrusting fauna, mainly encrusting bryozoans and in the shallower areas, encrusting coralline algae. Cup corals, including an as yet unrecognised species of small colonial cup coral, are present throughout the site, and brittlestars are common on both bedrock and stony reef. Sediment scour appears to have a strong structuring force within the site, with low relief bedrock subject to scour having a lower faunal diversity than sites less affected by scour (Whomersley *et al,* 2010). Highly scoured bedrock is mainly colonised by the keel worm *Pomatoceros triqueter.* On less scoured bedrock reef a range of sponges occur, alongside bryozoans and hydroids. In shallower areas subject to increased water movement from tidal streams and wave action, there is an increasing abundance of species such as the soft coral *Alcyonium digitatum*, the cup coral *Caryophyllia smithii* and the jewel anemone *Corynactis viridis*, and in the shallowest locations foliose red algaes and kelp.

The site is located within the Scottish Continental Shelf Regional Sea (JNCC, 2004; Defra, 2004). There are five SACs within this regional sea for which reef is a qualifying feature. These are shown below, along with their characteristic features:

SAC	**Notable characteristics of Reef interest feature**
Sanday SAC	Bedrock reef of low topographic complexity in intertidal and subtidal waters with moderate energy levels. The reefs are in full salinity waters, and are subject to strong coastal influence. Dense forests of kelp *Laminaria* spp (to 20m depth) provide a habitat for species-rich, red algal turf communities. Sponges (e.g.*Clathrina coriacea*) and ascidians (e.g. *Aplidium punctum*) occur on the vertical rock faces. The tide-swept north coast supports a rich fauna of dense bryozoan/hydroid turf and dense brittlestar and horse mussel (*Modiolus modiolus)* beds in mixed sediment below the kelp zone.

Papa Stour SAC	Very exposed bedrock and stony reefs of high topographic complexity (intertidal, infralittoral and circalittoral) reaching depths of more than 30m. The reefs are in full salinity waters, and are subject to moderate coastal influence. Extensive kelp forests extend to depths of up to 28m. Circalittoral communities are dominated by the soft coral *Alcyonium digitatum*, the featherstar *Antedon bifida*, encrusting coralline algae and the serpulid worm *Pomatoceros,* with turfs of the jewel anemone *Corynactis viridis*, ascidians and bryozoans. Scour-tolerant organisms such as the hydroid *Abietinaria abietina* and the brittlestar *Ophiocomina nigra* are also present.
North Rona SAC	Bedrock reef habitats of low and medium topographic complexity extending from the intertidal to the circalittoral. Support rich marine communities characteristic of very exposed, conditions (sponges, anemones, soft corals and ascidians). Kelp forests extend as deep as 35m. The reef is subject to full salinity and moderate coastal influences. The influence of the North Atlantic Drift is apparent in the presence of many southern species, but colder sub-arctic water accounts for the northern elements of the fauna and flora.
Sullom Voe SAC	Bedrock, stony and biogenic reef (*Modiolus modiolus*) in intertidal to circalittoral waters. Present in full salinity waters, exposed to a strong coastal influence and low to high energy levels. Intertidal rocky reefs range from steep, moderately-exposed bedrock at the seaward limit of the site to gradually sloping, extremely-sheltered bedrock in the inner reaches of the voes. Sublittoral bedrock is dominated by forests of the kelp *Laminaria hyperborea*. Bedrock and boulders below the kelp forest are heavily grazed but coralline algae, the keel worm *Pomatoceros triqueter* and the soft coral *Alcyonium digitatum*, may be present. There is a well-established horse mussel, *Modiolus modiolus* reef throughout the channel.
St Kilda SAC	Extremely wave-exposed bedrock reefs composed of hard, igneous rock, forming steep and vertical faces. These topographically complex reefs extend to depths of 50 m (encompassing the intertidal, infralittoral and circalittoral) and are subject to minimal coastal influence, full salinity waters and moderate to full energy levels. Dense kelp forests may occur as deep as 35 m due to water clarity. The reefs are dominated by diverse communities of anemones, sponges and soft corals, with different species of sponge, hydroid and bryozoan occurring in surge gullies and caves.

Wyville Thomson Ridge cSAC/SCI, situated within both the Scottish Continental Shelf Regional Sea and the Faroe-Shetland Channel Regional Sea (JNCC, 2004; Defra, 2004) has been recommended to Defra as an SAC for Annex I bedrock and stony reef and was submitted to the European Commission on 20th August 2010. Stanton Banks cSAC/SCI, has been recommended to Defra by JNCC for its reef feature in the Scottish Continental Shelf Regional Sea. This was submitted to the European Commission on 28th August 2008 and has been approved as a Site of Community Importance. This site is shown below with its characteristic features. Solan Bank Reef cSAC differs from these sites as it represents a range of depth zonations from the infralittoral to deep circalittoral zones, with different ecological communities to those at the other sites as a result. The ecological communities also vary throughout the site due to the changeable levels of localised energy, representing a broad range of faunal diversity. Within the adjacent Northern North Sea Regional Sea Pobie Bank reef cSAC is being recommended for Annex I reef, and within Rockall Trough and Bank Regional Sea, four sites have been recommended for their Annex I reef. These are all shown below with their characteristic features.

Candidate SAC	Notable characteristics of Reef interest feature
Wyville Thomson Ridge cSAC/SCI (Scottish Continental Shelf Regional Sea and the Faroe-Shetland Channel Regional Sea)	Wyville Thomson Ridge is a rock ridge composed of extensive areas of stony reef interspersed with gravel areas and bedrock reef along the flanks, located in deep circalittoral waters from 400m to 1000m depth. The stony reef is representative of iceberg ploughmarks, which are a regional variant of stony reefs. The site is exposed to full salinity waters and moderate to high energy levels. The reef habitat on the ridge is unique due to the distinctive hydrographic regime. The faunal communities are composed of species representative of hard marine substrata in deep water such as sponges, brachiopods, octocorals, carpet forming featherstars and sedentary, filter-feeding holothurians.
Stanton Banks cSAC/SCI (Scottish Continental Shelf Regional Sea)	Stanton Banks are a series of granite rises which outcrop from the seafloor south of the Outer Hebrides. They are deeply fissured and fringed at their edges with boulders and cobbles. The tops of the banks are smooth and characteristically colonised by encrusting red algae and small encrusting sponges. On the slopes, where the rock is less smooth, featherstars, dead mans fingers and hydroids colonise the surface abundantly.
Pobie Bank reef cSAC (Northern North Sea Regional Sea)	The stony and bedrock reef provides a habitat to an extensive community of encrusting and robust sponges and bryozoans, which are found throughout the site. In the shallowest areas the bedrock and boulders also support encrusting coralline algae. Axinellid cup sponges (*Axinella infundibuliformis*) are common on the bedrock and stony reef at depth ranges of 70m to over 100m. The bryozoan *Omalosecosa ramulosa* is also common on these reefs, but this species is rare in inshore sites in this regional sea. In the deepest areas (>100m), low-lying silty bedrock is commonplace, supporting small erect sponges, cup corals (*Caryophyllia smithii*) and the brittlestar *Ophiura albida*
Darwin Mounds cSAC/SCI (Rockall Trough and Bank Regional Sea)	Cold water coral reefs composed principally of the scleractinian coral, *L. pertusa* growing on (hundreds of) cone-shaped sandy mounds at a depth of approximately 1000m. The site covers an area of around 100 km². There are two main 'dense' fields referred to as Darwin Mounds East and Darwin Mounds West. The corals provide a habitat for various species of larger invertebrates such as sponges and brisingiids. The mounds support significant populations of the xenophyophore, *Syringammina fragilissima*
North West Rockall Bank cSAC/SCI (Rockall Trough and Bank Regional Sea)	Iceberg ploughmarks containing cobbles and boulders provide Annex I stony reef habitat. Associated biological communities include *Reteporella* sp*., Caryophyllia* sp*.,* serpulid worms and a large variety of sponge species. Interspersed with the stony reef, Annex I biogenic reef occurs as *L. pertusa* reef. Associated species include erect sponges, *C. cidaris* and stands of *M. oculata*. Cobble rubble surrounds the living reefs in many places, and supports fauna such as the squat lobster, *Munida rugosa*, the holothurian, *Stichopus tremulus*, ophiuroids and encrusting yellow sponges.

East Rockall Bank cSAC (Rockall Trough and Bank Regional Sea)	Bedrock, stony and cold water coral biogenic reef in the deep circalittoral to bathyal zone. Bedrock and stony reef supports assemblages of stylasterid lace corals and lobose sponges. Parasitic cones in the north of the site support sediment in-filled dead *L. pertusa* framework and live cold water coral reef, with antipatharians and gorgonians. Two canyon features cut into the flanks of the site and these are characterised by xenophyophores and decapod shrimps, with one canyon also supporting an abundance of caryophyllid corals and sea pens.
Anton Dohrn Seamount cSAC (Rockall Trough and Bank Regional Sea)	Hard bedrock reef of low topographic complexity, stony reef, and biogenic Lophelia pertusa reef in the deep circalittoral to bathyal zone (~500-1000m). Bedrock and boulder reef habitat on the seamount flanks support assemblages of holothurians, brittlestars, encrusting sponges, caryophyllid corals and lamellate sponges. Bedrock reef on parasitic cones and radial ridges supports relatively dense aggregations of gorgonians, antipatharians, Lophelia pertusa and soft corals. Biogenic reef is formed by live Lophelia pertusa reef and sediment in-filled dead L. pertusa frameworks.

Note: cSAC = candidate SAC (site approved by Government and submitted to the EC as a pSCI)
SCI = Site of Community Importance adopted by the EC

See http://jncc.defra.gov.uk/page-4168 for flow diagram

8 Site boundary

The site boundary for Solan Bank Reef cSAC has been defined using JNCC's marine SAC boundary definition guidelines (JNCC, 2012). The boundary is a relatively simple polygon enclosing the minimum area necessary to ensure protection of the Annex I habitat.

As any bottom trawling that occurs in the area may pose a threat to the reef, the cSAC boundary includes a margin to allow for mobile gear on the seabed being at some distance from the location of a vessel at the sea surface. The maximum depth of water around the feature is approximately 100m; assuming a ratio of 3:1 fishing warp length to depth on the continental shelf, the boundary is defined to include a margin of 300m from the bedrock and stony reef feature.

Note that the boundary described is for the candidate SAC. Any future management measures which may be required under the Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2007 (as amended) will be determined by Competent Authorities in consultation with JNCC, and may have different boundaries to the SAC site boundary.

9 Assessment of interest feature against selection criteria

9.1 Reefs – Annex III selection criteria (Stage 1A)

a) Representativity

Solan Bank Reef is located in the Scottish Continental Shelf Regional Sea and represents hard bedrock reef and stony reef in the infralittoral, circalittoral and deep circalittoral zones. The site is in full salinity waters, subject to moderate/high energy levels with an intermediate level of coastal influence. High topographical areas are composed of bedrock, jointed with linear features of up to 10m in height.

The majority of the reefs are characterised by encrusting fauna, differing in diversity due to the changeable levels of localised energy. A range of species are present, representing the range of depth zonations present in the site; species common to shallow areas are present along with species found in deeper water. A number of notable rare species were also recorded, including an as yet unrecognised species of colonial cup coral (Plate 1) and the sponges, *Oceanpia robusta* (Plate 2) and *Poecillastra compressa* (Plate 3). The site's biotopes are similar to two of the moderate energy circalittoral rock biotopes classified in the Marine Habitat Classification (Connor *et al,* 2004) but with a slight variation in the representative species, for example more northerly species, and differences caused by the effects of sediment scour. Therefore three new biotopes have been proposed to characterise these habitat variations.

This extensive bedrock and stony reef is an excellent example of offshore infralittoral, circalittoral and deep circalittoral reef within this regional sea.

The grade for this feature is A (excellent representativity).

b) Area of habitat

The reef feature is approximately 38,656ha (387 km^2) in area (flat mapped extent). This has been estimated from a review of multibeam data, sidescan sonar data, seabed imagery and grab sampling. The data was interpreted and the reef extent was mapped accordingly.

An estimate of the entire Annex I reef resource (bedrock, stony and biogenic reef) in UK waters is 7,180,000 hectares. This total extent figure gives the following thresholds for the grades of this criterion (CEC, 2011):

A – extents between 1,077,000 and 7,180,000 ha (15-100% of total resource)
B – extents between 143,600 and 1,077,000 ha (2-15% of total resource)
C – extents less than 143,600 ha (0-2% of total resource)

This site's feature therefore falls within the "0-2" bracket for Area of Habitat and is graded C.

c) Conservation of structure and functions

Degree of conservation of structure

Available evidence indicates that fishing with demersal otter trawls, targeting mainly *Nephrops norvegicus,* occurs in the vicinity of Solan Bank Reef and reaches levels of 50 hrs active fishing per annum in some areas. This is predominately around the reef but may also occur over the stony reef and surrounding sediments. However, the majority of fishing activity in the region is mid-water otter trawling and creeling which would cause minimal impact to the structure of the reef. No physical damage is evident from video and stills imagery of the reef and it is therefore likely the activity does not have a large impact on the reef structure.

Oil and gas exploration is not operating in the region of Solan Bank Reef, and no cables or pipelines run in the vicinity of the site. Similarly no renewable energy structures occur in the region of the site.

The grading for this sub-criterion is therefore II: structure well conserved.

Degree of conservation of functions

The prospects of this feature to maintain its structure in the future, taking into account unfavourable influences and reasonable conservation effort, are good. A mechanism is available through the European Commission's Common Fisheries Policy regulations to modify fishing activity in the area if this is deemed to be necessary. In addition, regulations are in place to regulate oil and gas activity in and around SACs in the UK Continental Shelf Designated Area. The laying of submarine cables and pipelines also requires regulatory consent. The reef is distant from terrestrial sources of pollution.

The grading is II: good prospects

Restoration possibilities

Restoration of the biological communities in the Solan Bank Reef would be possible, accepting that restoration methods in the offshore area focus on the removal of impacts which should allow recovery where the habitat has not been removed. It is likely that a similar community to that present now would develop if activities causing damage were removed.

The grading is II: restoration possible with an average effort

Overall grade

Due to the first sub-criterion of this criterion being graded II: structure well conserved and the second sub-criterion being graded II: good prospects, the overall grading is B: good conservation, regardless of the other sub-criteria.

d) Global assessment

The suggested grades for Stage 1A criteria a)-c) are A, C and B respectively. Taking all the above factors into consideration, the Global Assessment grade is B ('good conservation value')

Summary of scores for Stage 1a criteria

Habitat type	Representativity	Area of habitat	Structure and function	Global assessment
Solan Bank	A	C	B	B

9.2 Harbour porpoise (*Phocoena phocena)* - Annex III selection criteria (Stage 1B)

a) Proportion of UK population

Harbour porpoise (*Phocoena phocoena*) is found throughout the majority of UK continental shelf waters (Reid *et al*., 2003; SCANS II, 2008). The species is widespread along the Scottish north coast and has been recorded in the area of the cSAC (Evans *et al*, 2003; Reid *et al,* 2003, SCANS II, 2008). However the sightings data indicate that the occurrence of the species is similar or lower than in neighbouring areas and this suggests that the size and density of the population is not significant in the site. Harbour porpoise is therefore considered to be grade D, i.e. a non significant population and so it is not a qualifying species for this site. As such, no other indication is required for the additional evaluation criteria concerning this species within the site.

9.3 Bottlenose dolphin (*Tursiops truncatus*)

a) Proportion of UK population

Bottlenose dolphin (*Tursiops truncatus*) is found in many parts of UK waters, on the continental shelf and further offshore (Evans *et al*, 2003; Reid *et al*., 2003; SCANS II, 2008). It is locally fairly common near-shore off the coast of north east Scotland (particularly in the Moray Firth and south to the Firth of Forth) (Evans *et al,* 2003; Reid *et al*, 2003). There are no records of bottlenose dolphin occurrences within the cSAC boundary (Reid *et al*., 2003; SCANS II, 2008) therefore the species is not considered a feature of the site. However, they have been recorded in the vicinity of the site (Evans *et al*, 2003) and are highly mobile, so this assessment may change if new data become available.

9.4 Grey seal (*Halichoerus grypus*)

a) Proportion of UK population

From satellite telemetry work, grey seals are known to be occasionally present in the area (Matthiopoulos *et al* 2004; Matthiopoulos, 2007). At this time however, it is not possible to estimate what proportion of the population of the species uses the area, or how important the area is with respect to the physical and biological factors essential to their life and reproduction. Grey seal is therefore considered to be grade D, i.e. a non significant population and so it is not a qualifying species for this site. This grading may be revised at a later date depending on the outcome of data analyses to be commissioned by JNCC that will enable a more detailed assessment of the importance of areas for seals at sea.

9.5 Harbour (Common) seal (*Phoca vitulina*)

Harbour (common) seals are found in the vicinity of the site boundary and the Scottish north coast. The species is highly mobile, regularly travelling 15-30km to forage and sometimes over 200km (Sharples *et al.,* 2005). The area of the cSAC is therefore not a particularly

important area for harbour seals and the grading for this species is D, i.e. a non significant population, and so it is not a qualifying species for this site.

10 Sites to which this site is related

None

11 Supporting scientific documentation

The information to support this offshore SAC recommendation comes primarily from the JNCC commissioned survey CEND 11/08 aboard the *R/V Cefas Endeavour* and its associated report (Whomersley *et al*., 2010). Multibeam data collected over an area of 25 km by 20 km, for the Maritime and Coastguard Agency (MCA) under the Civil Hydrography Programme was utilised to focus survey effort and assist in data analysis and habitat mapping.

Corridors of acoustic data coverage were acquired during the CEND 11/08 survey, providing high resolution sidescan sonar and multibeam echo-sounder data to supplement the full-coverage multibeam data from the MCA. Video and still imagery was collected at 44 sites using a drop camera system. Benthic grab sampling was also undertaken with a Hamon grab, which was fitted with a video camera, to sample sandy areas identified during the deployment of the drop camera, and a rock dredge to sample cobbles. Both the Hamon grab and rock dredge provided specimens for biological analyses.

These collective acoustic and groundtruthing samples were used to identify and interpret the extent of substrate that qualified as Annex I habitat in this area. Irving (2009) provides further UK interpretation on the definition of Annex I ‘stony reef’.

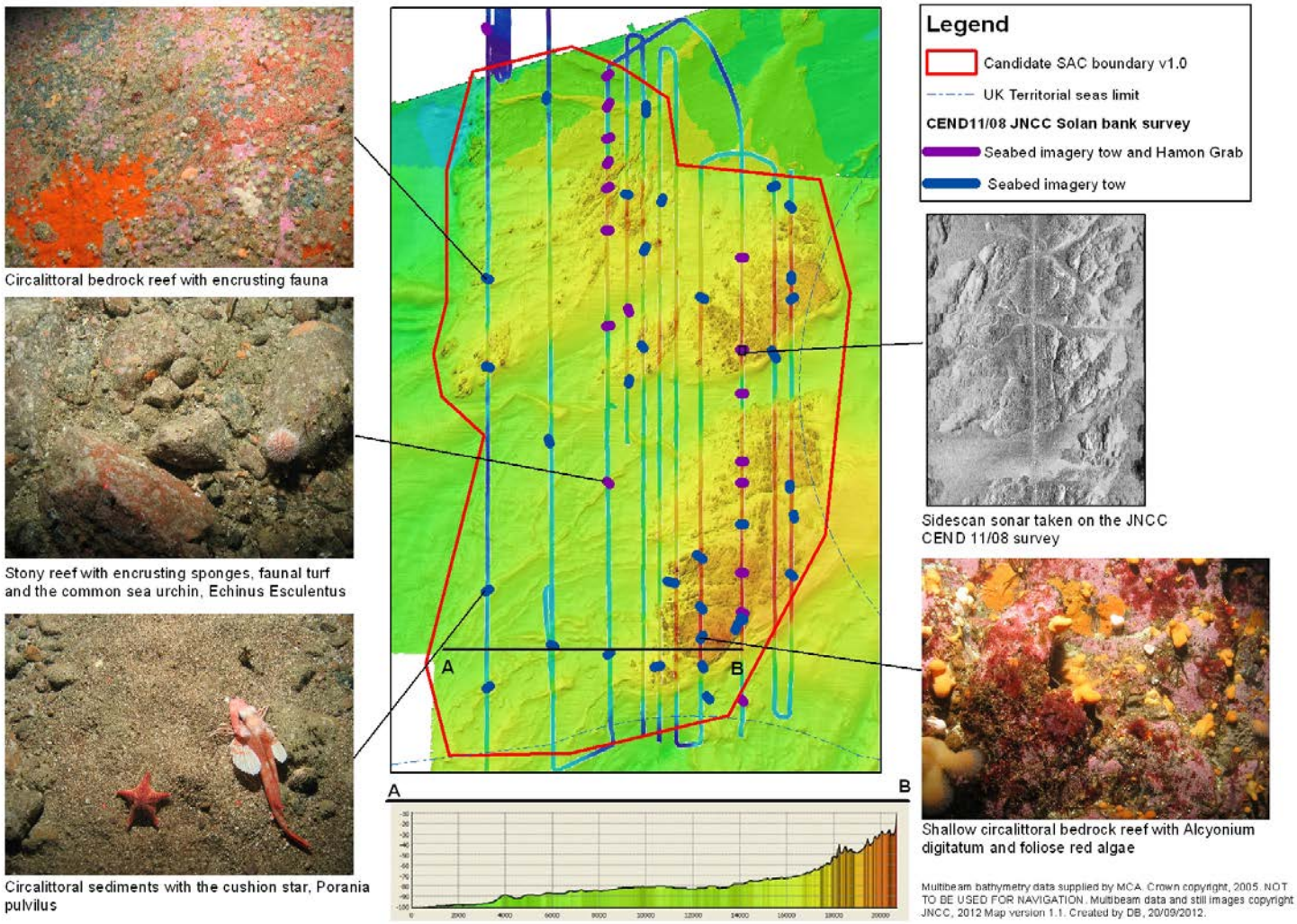


Figure 1. Data map showing MCA multibeam data coverage and corridors of multibeam data collected during the CEND 11/08 survey. The cross section A-B illustrates the depth range across the site (blues and greens represent depths >80m, oranges and yellows represent depths of ~20m to 80m). Locations of seabed imagery data and grab stations are marked in purple and blue, with example images of habitat types.

12 Site overview and conservation interest

Solan Bank Reef is being recommended for inclusion within the Natura site network for its Annex I reef. The site lies in an area of numerous geological structural features. It is located on the Solan Bank High, a north west trending Precambrian basement rock, flanked to the west by the North Rona, North Lewis and North Minch basins and to the east by the West Orkney basin (Stoker *et al,* 1993; Whomersley *et al*, 2010).

Outcropping rock on the Solan Bank High is composed of metamorphic schists and gneisses and these outcrops form areas of high topographic complexity bedrock. Multibeam coverage collected by the MCA under the Civil Hydrography Programme clearly shows the distribution of bedrock outcrops in the site, where the reef stands proud of the surrounding sediment. In some areas the bedrock is jointed with linear features of ENE-WSW and SE-NW orientation, forming cliffs of up to 10m in height. In other areas 'roches moutonnées' (Sugden *et al,* 1992; Whomersley *et al,* 2010) are present where glacial polishing has smoothed the bedrock surface. Seabed imagery reveals that large crevices in the bedrock harbour stable boulders and cobbles, providing stony reef habitat whilst smaller fissures in the bedrock are infilled with a mixture of coarse sand and shell gravel veneer. A veneer of sand is also present over the flat bedrock surfaces, indicating that sediment scour is a significant factor across the site (Whomersley *et al,* 2010).

Where the bedrock is not exposed at the seabed surface (to the north west and south west of the outcropping bedrock), there are extensive plains of flat seabed composed of coarse sediment. Multibeam data gathered for the MCA shows evidence of large ridge/bank features up to 4m in height, indicative of morainic ridges formed during glacial retreat (Whomersley *et al,* 2010). Seabed imagery gathered during the CEND 11/08 survey confirms that these ridges are composed of boulders and cobbles exposed at the seabed due to winnowing, with a thin, commonly absent, veneer of sand. To the north of the site, boulder and cobble fields are present on a moraine. These boulder/cobble fields and morainic ridges for which seabed imagery was obtained, meet the definition of Annex I sub-type 'stony reef' as outlined by the 'Interpretation manual of EU habitats' (EC, 2007) and further clarified by Irving (2009).

Outcropping bedrock representing the sub-type 'bedrock reef' is mostly situated in the circalittoral zone (deeper than 48m water depth). To the south and east of the site, smaller outcrops of bedrock occur in the shallow circalittoral zone (from 28m to 48m water depth), with scattered foliose red seaweeds recorded in the shallower depths. The shallowest areas of outcropping bedrock were recorded in the south of the site with water depths <28m, where kelp park predominates (Figure 3).

The majority of the reef areas are characterised by encrusting fauna, particularly bryozoans and in the shallower areas, encrusting coralline red algae. Areas of low relief bedrock reef in the circalittoral zone show signs of being strongly affected by sediment scour, with a much lower faunal diversity recorded here than in other areas (Whomersley *et al,* 2010). The majority of these scoured bedrock areas are dominated by the keel worm *Pomatoceros triqueter.* Faunal diversity increases in areas where scour impact is lower, and common species include the bryozoans *Flustra foliacea* and *Securiflustra securifrons,* the hydroids *Tubularia indivisa, Sertularella gayi* and *Nermertesia* spp. and a variety of sponges including *Hymedesmia paupertus, Axinella infundibuliformis, Tethya norvegica/hibernica, Quasilina brevis and Stelligera stuposa* (Whomersley *et al,* 2010). Many bedrock and stony reef areas are colonised by an abundance of the brittlestars *Ophiocomina nigra*, *Ophiothrix fragilis* and *Ophiactis balli.* The echinoids *Stichastrella rosea, Asterias rubens, Luidia ciliaris, Marthasterias glacialis* and *Echinus esculentus* are also common on the reefs. The erect calcareous bryozoan, *Porella compressa,* occurs throughout the site on circalittoral bedrock

reef (>48m depth), but is most common on bedrock reef to the north west of the site. Cup corals are frequent across the site, including an unrecognised species of colonial cup coral (Plate I). Two sponges classified as rare, *Poecillasta compressa* and the deep water species *Oceanapia robusta,* have also been identified at this site (B.Picton, *pers.comm.*), (Plates 2 and 3).

In the shallow circalittoral regions bedrock outcrops are less affected by sediment scour and a greater diversity of bryozoan and hydrozoan turf dominates, alongside an increased abundance of the soft coral *Alcyonium digitatum*, the cup coral *Caryophyllia smithii,* jewel anemone *Corynactis viridis* and plumose anemone *Metridium senile*. Foliose red algae are also present in the shallower areas.

The small areas of bedrock reef outcrop in the infralittoral zone support a dense foliose red algal turf of *Delesseria sanguinea* in addition to *Laminaria hyperborea* kelp park. This is one of the few known examples of offshore infralittoral Annex I reef in this regional sea which is subject to intermediate/minimal coastal influence.

Much of the circalittoral bedrock and stony reef communities at Solan Bank Reef are similar in representation to the CR.MCR.EcCr.CarSp.PenPcom biotope (*Caryophyllia smithii* and sponges with *Pentapora foliacea*, *Porella compressa* and crustose communities on wave-exposed circalittoral rock) (Connor *et al,* 2004). However the biotope at Solan Bank Reef appears to differ slightly as no *Pentapora foliacea* was recorded but instead an abundance of the encrusting bryozoan *Cellapora pumicosa* is present. Two new biotopes have therefore been proposed by Whomersley *et al* (2010) within the CR.MCR.EcCr.CarSp.PenPcom biotope complex, representing the more and less scoured habitats, and have been submitted to JNCC for further investigation prior to updating the classification. For the purposes of the study, the biotope classes are labelled as follows:

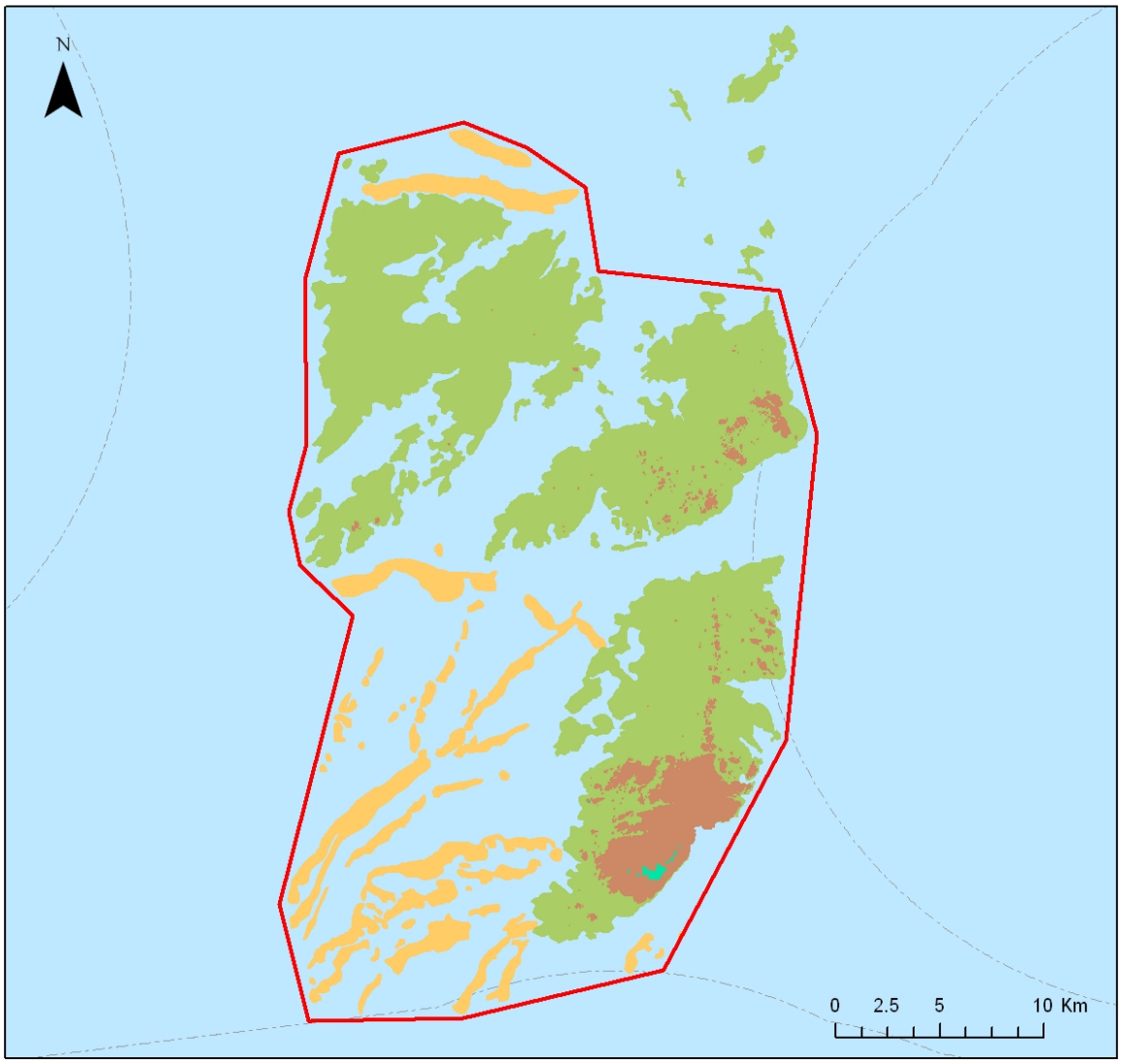
- CR.MCR.EcCr.CarSp.PenPcom.1 (A4.2122v1 EUNIS class): *Porella compressa* with cup corals, sponges, *Cellapora pumicosa* and crustose communities on wave-exposed circalittoral rock (see Plate 4).

- CR.MCR.EcCr.CarSp.PenPcom.2 (A4.2122v2 EUNIS class): *Porella compressa* with cup corals and sparse crustose communities on wave-exposed circalittoral rock (see Plate 5).

In addition some of the circalittoral bedrock and stony reef communities are similar in composition to the biotope Cr.MCR.EcCr.CarSp.Bri. However the species seen at Solan Bank Reef appear to be representative of more northerly species and therefore an alternative biotope has been proposed by Whomersley *et al* (2010) and is labelled as follows:

- Cr.MCR.EcCr.CarSp.Bri.1 (A4.2121v1 EUNIS class): Brittlestars overlying coralline crusts, *Parasmittina trispinosa* and *Caryophyllia smithii* on wave-exposed circalittoral rock, northern version (see Plate 6).

The shallow circalittoral bedrock reefs represent the biotope CR.HCR.FaT.CTub.Adig (*Alcyonium digitatum* with dense *Tubularia indivisa* and anemones on strongly tide-swept circalittoral rock). The infralittoral bedrock reefs represent the biotope IR.HIR.KFaR.LhypR.Pk (*Laminaria hyperborea* with dense foliose red seaweeds on exposed infralittoral rock). Both of these biotopes show a dominance of the anemone *Corynactis viridis,* not found in the surrounding deeper areas.



Legend

- Candidate SAC boundary v1.0
- Land
- UK Territorial seas limit

Infralittoral Bedrock Reef

- IR.HIR.KFaR.Lhyp.Pk

Shallow Circalittoral Bedrock Reef

- CR.HCR.FaT.CTub.Adig
- CR.HCR.Xfa.SpAnVt

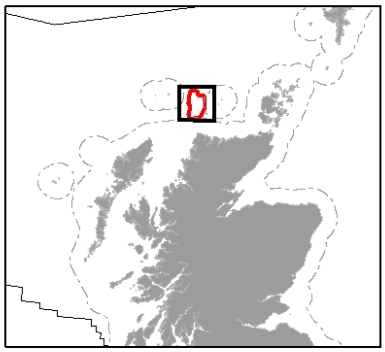
Circlittoral Bedrock Reef

- CR.MCR.EcCr.CarSp.PenPcom.1
- CR.MCR.EcCr.CarSp.PenPcom.2
- CR.MCR.EcCr.CarSp.Bri.1

Stony Reef

- CR.MCR.EcCr.CarSp.PenPcom.1
- CR.MCR.EcCr.CarSp.PenPcom.2

Location of main map in relation to the UK



Map projected in UTM (Zone 30N. WGS84 datum). World Vector Shoreline © US Defense Mapping Agency. NOT TO BE USED FOR NAVIGATION. The exact limits of the UK Continental Shelf are set out in orders made under section 1(7) of the Continental Shelf Act 1964 (© Crown Copyright). Map version number 1.2 (20/09/2012). Created by DB. Map copyright JNCC, 2012.

Figure 2. Broadscale habitat map depicting habitat types and associated biotopes.

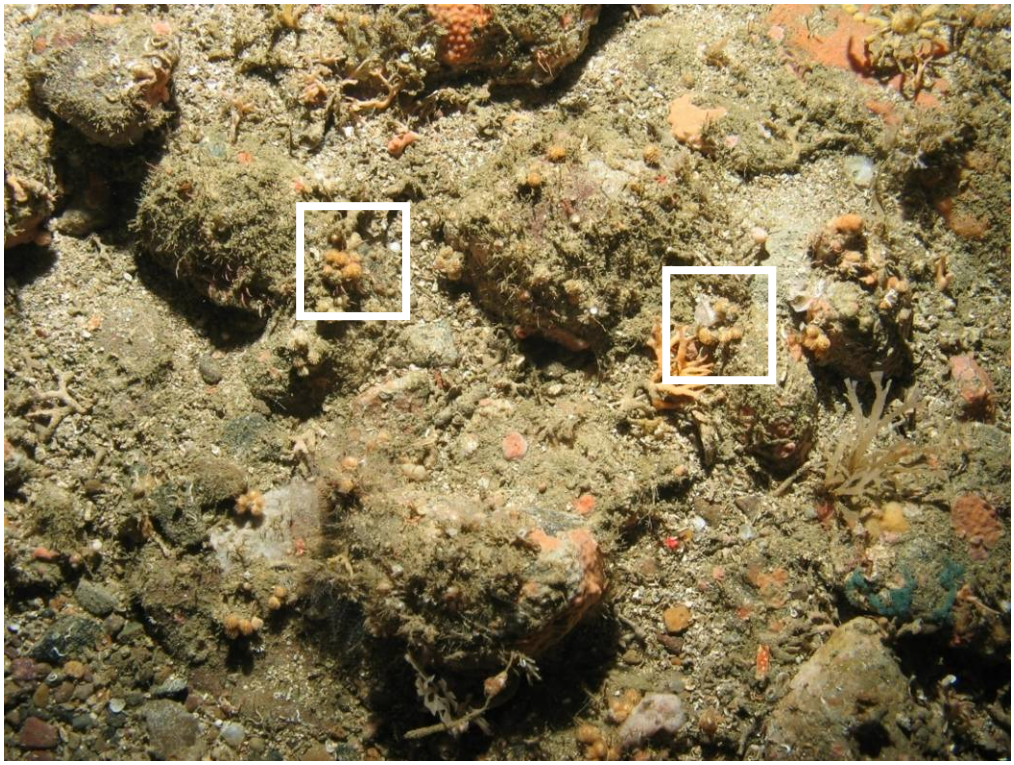


Plate 1. Example of the unidentified colonial cup corals. (Station DC16; © JNCC)

Plate 2. Example of *Oceanapia robusta* (Station DC16; © JNCC)

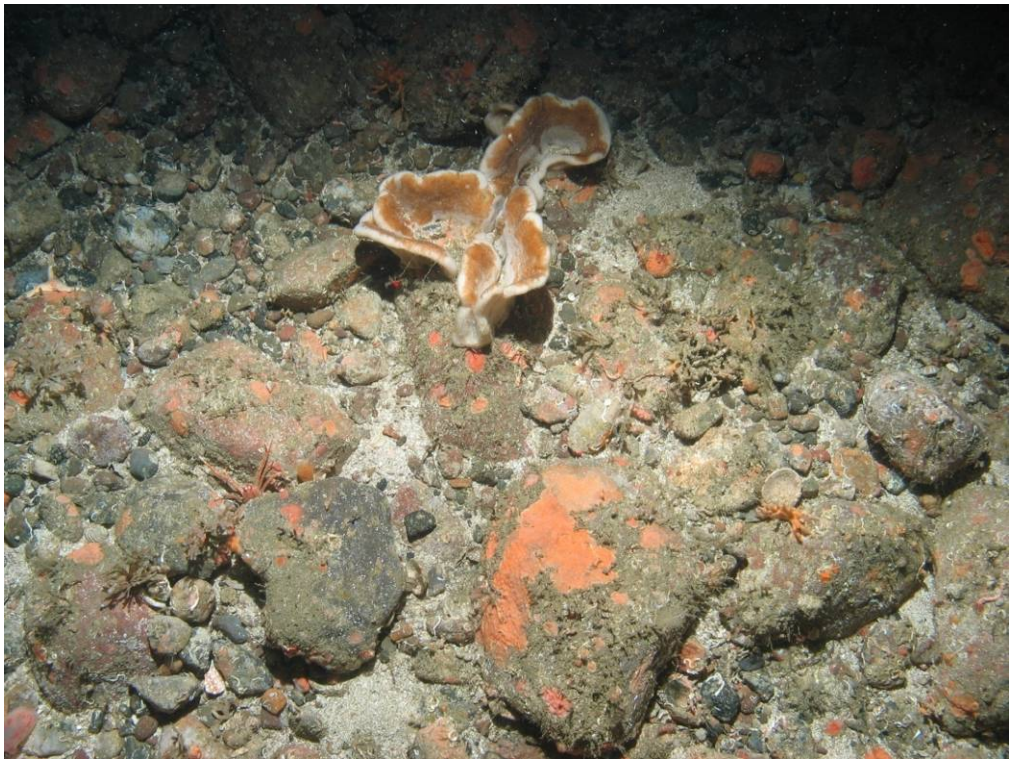


Plate 3. Example of *Poecillastra compressa* (Station DC34; © JNCC)

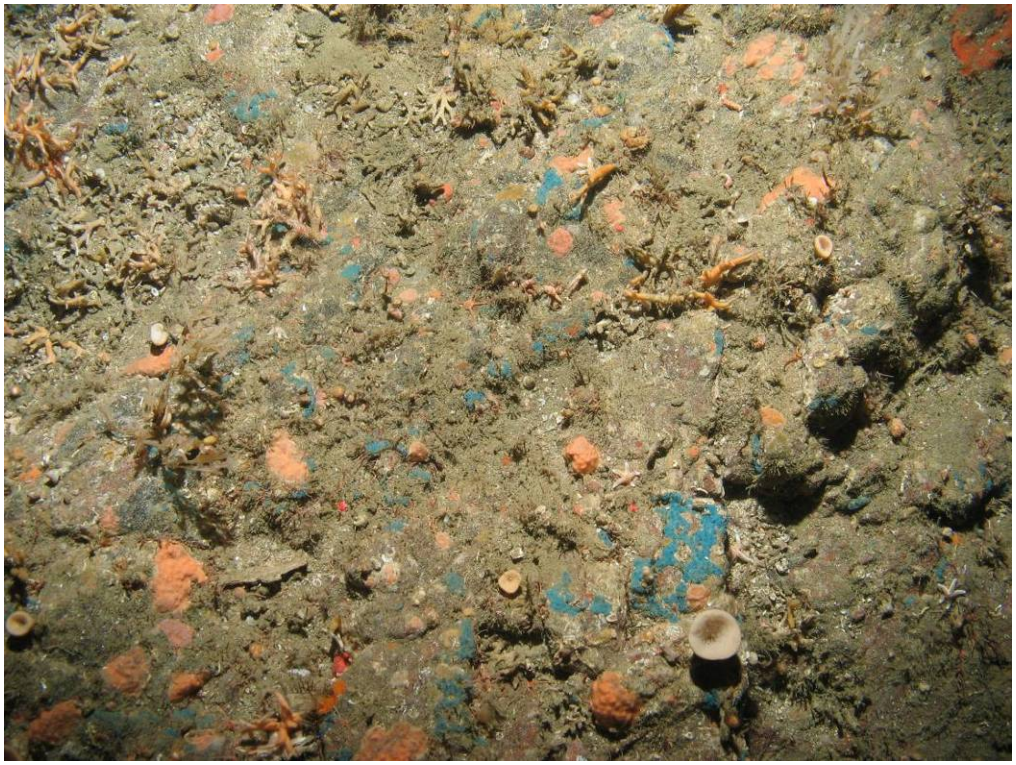


Plate 4. Example of the proposed biotope CR.MCR.EcCr.CarSp.PenPcom.1 (Station DC20; © JNCC)

Plate 5. Example of the proposed biotope CR.MCR.EcCr.CarSp.PenPcom.2 (Station DC10; © JNCC)

Plate 6. Example of the proposed biotope CR.MCR.EcCr.CarSp.Bri.1 (Station DC51; © JNCC)

13 References

COMMISSION OF THE EUROPEAN COMMUNITY (CEC). 2011. Natura 2000 Standard Data Form: Explanatory Notes. Brussels, European Commission DG Environment. Available from: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011D0484:EN:NOT [Accessed September 2012].

CONNOR, D.W., ALLEN, J.H., GOLDING, N., HOWELL, K.L., LIEBERKNECHT, L.M., NORTHEN, K.O., REKER, J.B., 2004. *The Marine Habitat Classification for Britain and Ireland Version 04.05* [online]. Peterborough, JNCC. ISBN 1 861 07561 8. Available from: http://jncc.defra.gov.uk/MarineHabitatClassification [Accessed September 2012].

DEFRA. 2004. *Review of Marine Nature Conservation. Working Group Report to Govern,ment* [online]. London, Defra. Available from: http://archive.defra.gov.uk/environment/biodiversity/marine/documents/rmnc-report-0704.pdf [Accessed September 2012].

EUROPEAN COMMISSION (EC). 2007. Interpretation Manual of European Union Habitats, EUR27. Available from: http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/2007_07_im.pdf [Accessed September 2012]

EVANS, P.G.H., ANDERWALD, P. & BAINES, M.E., 2003. UK Cetacean Status Review. *Report to English Nature and the Countryside Council for Wales*. Oxford, UK, Sea Watch Foundation.

IRVING, R., 2009. The identification of the main characteristics of stony reef habitats under the Habitats Directive. Summary report of an inter-agency workshop 26-27 March 2008. *JNCC* Report No. 432. Available from: http://jncc.defra.gov.uk/pdf/web_432.pdf [Accessed September 2012].

JNCC. 2004. The Irish Sea Pilot Final Report. *Report to Defra by the Joint Nature Conservation Committee* [online]. Peterborough, JNCC. Available from: http://jncc.defra.gov.uk/page-2767#download [Accessed September 2012].

JNCC. 2012. *UK Guidance on defining boundaries for marine SACs for Annex I habitat sites fully detached from the coast* [online]. Peterborough: JNCC. Available from: http://jncc.defra.gov.uk/pdf/SACHabBoundaryGuidance_2012Update.pdf [Accessed September 2012].

MATTHIOPOULOS, J., MCCONNELL, B., DUCK, C. & FEDAK, M., 2004. Using satellite telemetry and aerial counts to estimate space used by grey seals around the British Isles. *Journal of Applied Ecology*, **41**, 476-491.

MATTHIOPOULOS, J., 2007. Preliminary methods for designing marine SACs for UK pinnipeds on the basis of space use. *SCOS 2007* Briefing Paper 07/8.

REID, J.B., EVANS, P.G.H. & NORTHRIDGE, S.P., 2003. *Atlas of cetacean distribution in north-west European waters* [online]. Peterborough, JNCC. Available from http://jncc.defra.gov.uk/page-2713 [Accessed September 2012].

PICTON, B. 2010. *Personal Communication*. National Museums Northern Ireland, Co. Down.

SCANS II. 2008. Small Cetaceans in the European Atlantic and North Sea. *Final Report submitted to the European Commission under project LIFE04NAT/GB/000245*. Available from: SMRU, Gatty Marine Laboratory, University of St Andrews, St Andrews, Fife, KY16 8LB, UK.

SHARPLES, R.J., CUNNINGHAM L., HAMMOND P.S., 2005. Distribution and movements of harbour seals around the UK. *Briefing paper for the Special Committee on Seals 2005*.

STOKER, M.S., HITCHEN, K. AND GRAHAM, C.C., 1993. United Kingdom Offshore Regional Report: the Geology of the Hebrides and West Shetland Shelves, and adjacent deep-water areas. London: HMSO for the British Geological Survey.

SUGDEN, D.E., CLAPPERTON, C.M. AND GLASSER, N. 1992. Evolution of large roches moutonneés. *Geografiska Annaler*, **74A**, 253-264.

WHOMERSLEY, P., WILSON, C., LIMPENNY, D. AND LESLIE, A., 2008. Understanding the marine environment – seabed habitat investigations of submarine structures in the mid-Irish Sea and Solan Bank Area of Search (AoS) – cruise report. JNCC Contract No: F90-01-1200. *CEFAS* Cruise Report CEND 11/08, 120pp.

WHOMERSLEY, P., WILSON, C., CLEMENTS, A., BROWN, C., LONG, D., LESLIE, A. & LIMPENNY, D. 2010. Understanding the marine environment – seabed habitat investigations of submarine structures in the mid Irish Sea and Solan Bank Area of Search (AoS). *JNCC* Report No. 430. Available from: http://jncc.defra.gov.uk/PDF/jncc430_webversion.pdf [Accessed September 2012]