

**Offshore Special Area of Conservation:
East Rockall Bank**

SAC Selection Assessment Document



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Version 5.0 (31st October 2012)

¹ Parasitic cone with *Lophelia pertusa* cold water coral, *Actiniaria* anemones, *Caryophyllia* sp. and *Henricia sanguinolent*. (ER_N_04_251)

Introduction

This document provides detailed information about the East Rockall Bank site 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 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 waters. Under these Regulations, JNCC has an obligation to provide certain advice to the Scottish Government to enable Ministers and Competent Authorities 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 has been asked by the 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 in order to be eligible. Socio-economic factors are not taken into account in the identification of sites to be proposed to the European Commission.²

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).

² 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 (31/10/12)	Updated to candidate SAC throughout document.	Scottish government
SAC SAD Version 4.0 (31/08/12)	Updated following consultation - datamap and supporting scientific information, reference links. Sub group comments addressed.	Scottish government
SAC SAD Version 3.0 (05/03/12)	Updated to possible SAC throughout document. Maps updated with grids.	Public consultation.
SAC SAD Version 2.0 (12/12/11)	Updated to draft SAC throughout document. Sub-group and committee comments incorporated, text and maps amended. Data added to datamap, references updated. Text added on current situation of a proposed ICES closure	Scottish Government
SAC SAD Version 1.0 (08.09.11)	Comments incorporated and sent for approval to the MPATG	MPA Technical Group and UKMBPSG
SAC SAD Version 0.1 (15.07.2011)	Proposed site boundary defined; SAC SAD drafted	MPA and Marine Advice teams

Further information

This document is available as a pdf file on JNCC's website for download if required (jncc.defra.gov.uk).

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Site Name SAC: Selection Assessment Document

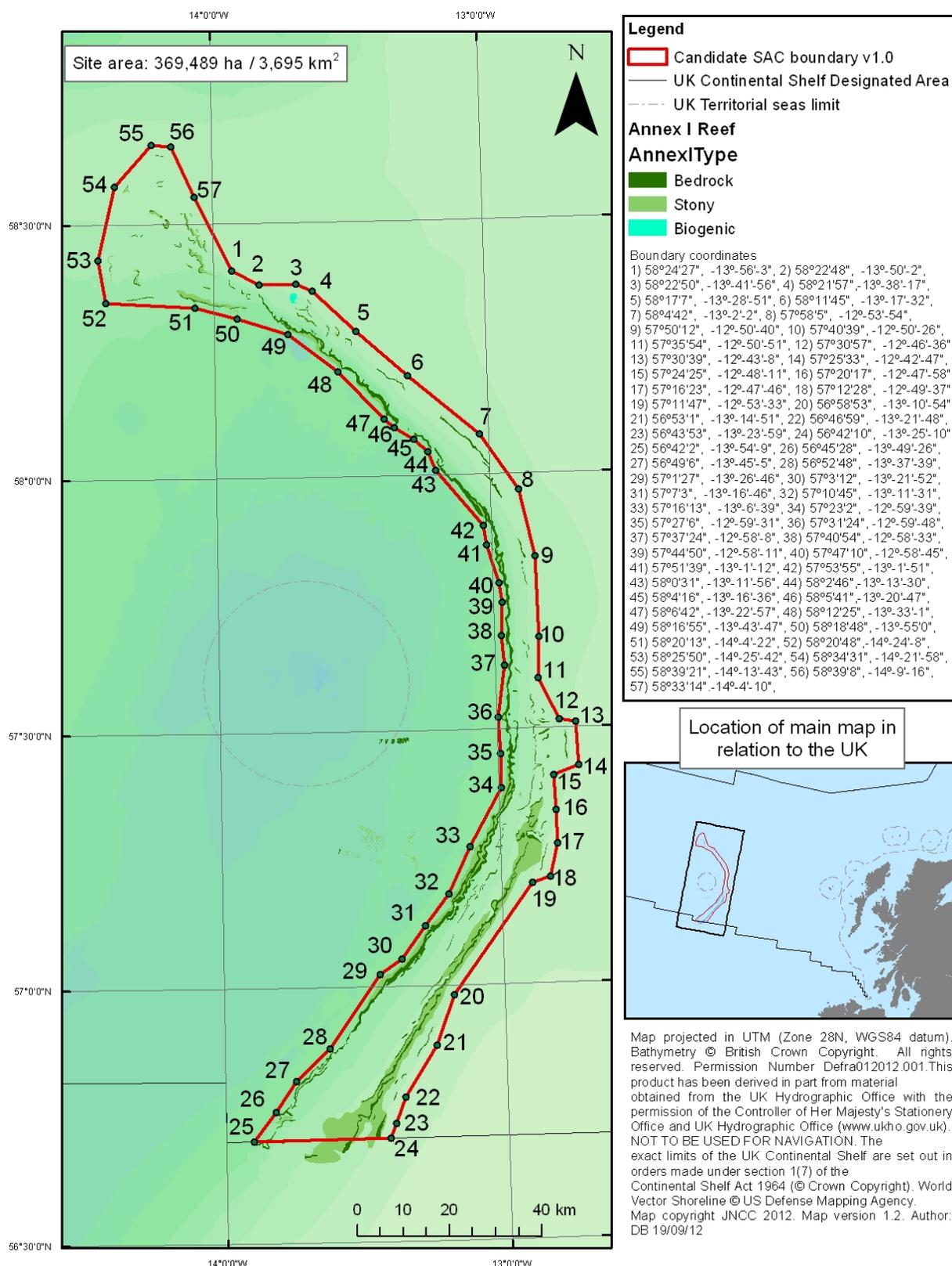
1. Site name East Rockall Bank	2. Site centre location 57°39'16"N, 12°54'36"W
3. Site surface area 369,489 ha / 3,695 km ² (Datum: WGS 1984 UTM Zone 28 North, calculated in ArcGIS)	4. Biogeographic region Atlantic

5. Interest features under the EU Habitats Directive

1170 Reefs

6. Map of site

Offshore Special Area of Conservation Site Map: East Rockall Bank



7. Site summary

East Rockall Bank is located to the west of Scotland, about 320km west of the Outer Hebrides. It is located along the eastern flank of Rockall Bank, a geological feature approximately 450km long and 200km wide, orientated northeast to southwest, ranging in depth from 0m (where a rocky 'island' outcrop breaks the surface) to 1000m (Howell *et al*, 2009). The eastern edge of Rockall Bank forms a scalloped faulted scarp slope, which descends steeply down into the Rockall Trough at around 1000 to 1500m water depth (Howell *et al*, 2009, Long *et al*, 2010).

The site is proposed for its Annex I reef, consisting of bedrock, biogenic and stony reef. The eastern edge of the Rockall Bank summit comprises fine sand with iceberg ploughmarks where stony reef of mixed cobbles and pebbles supports erect bryozoans such as *Reteporella* sp., *Munida* sp., axinellid sponges and encrusting sponges. Historical records (Wilson, 1979a and b) indicate the occurrence of *Lophelia pertusa*, and clumps of *Lophelia pertusa* reef were seen to be associated with coral rubble fringes from data collected on survey in 2005 (Howell *et al*, 2009). Coral rubble was also seen on survey in 2009 (Long *et al*, 2010). This could be due to fishing activity that mainly occurs on the summit but also spreads towards the edges of the bank, as evidenced by trawl scars observed on the 2009 JNCC survey and from Vessel Monitoring System (VMS) data for 2006-2010.

The eastern flank of Rockall Bank comprises steep slopes between 400 – 750m depth which are composed of mixed substrates of boulders, cobbles and pebbles with areas of exposed bedrock and bedrock outcrop (Howell *et al*, 2009). A rocky ledge of bedrock reef runs the length of the eastern flank and this supports assemblages of lace corals (stylasterid) and lobose and encrusting sponges (Long *et al*, 2010). Further down the slope of the eastern flank, the substrate changes to stony reef, composed of boulders and cobbles which support lower abundances of stylasterid corals and higher abundances of sponges. JNCC have commissioned a contract to improve the definition of the OSPAR habitat 'coral gardens' (OSPAR, 2010a) and apply the definition to infer the location of coral garden habitat in UK waters. The results support the presence of coral gardens on the eastern flank of East Rockall Bank within the cSAC boundary (Henry & Roberts, in prep a).

Within the northern end of the site between 950 m to 1100 m depth, the new biotope 'Various sponge forms, corals and ascidians on mixed, boulder and ledges' has been identified, which contains encrusting, globose and lamellate sponges, caryophyllids, *Stichopathes*, and ascidians. The new 'Stylasterids and lobose sponges on bedrock and mixed substrate' biotope (which contains Saddle oysters, brachiopods, *Munida*, serpulids, Stylasterids, *Cidaris* and Lobose sponges) also runs along the entire ridge to the west of site at around 300 m. Deep sea sponge aggregations such as those found in the north have been identified as a potential sub-type of Annex I reef. A habitat verification contract commissioned by JNCC has since confirmed the likely presence of deep sea sponge aggregations as defined by the OSPAR Commission (OSPAR, 2010b) within the site boundary. Greater confidence could be assigned to records if information on the density of sponge records were available (Henry & Roberts, in prep b).

Small mound features are located on the flanks of the bank with sediment in-filled dead *Lophelia pertusa* reef. Live *Lophelia pertusa* biogenic reef was found associated with parasitic cones in the northern region of East Rockall Bank which support a diverse assemblage of antipatharian and gorgonian corals (Long *et al*, 2010). Further examples of bedrock and biogenic reef and coral rubble were observed in the northern region from a National Oceanography Centre (NOC) survey (Huvenne, 2011)

Two canyons which cut into the flanks of Rockall Bank were identified on a 2009 JNCC offshore Natura survey (Stewart *et al*, 2009; Long *et al*, 2010). These are characterised by xenophyophores and decapod shrimps, and the narrower canyon also supports dense aggregations of caryophyllids on the canyon floor and sea pens on the canyon flanks.

East Rockall is located within the Rockall Trough and Bank Regional Sea (JNCC, 2004; Defra, 2004). Within this Regional Sea three other areas are SACs with Annex I reef as a qualifying feature. These are noted below with their characteristic features.

SAC	Notable characteristics of Reef interest feature
Darwin Mounds cSAC/SCI	Cold water coral reefs composed principally of the scleractinian coral <i>Lophelia pertusa</i> growing on (hundreds of) cone-shaped sandy mounds at a depth of approximately 1000m. The site covers an area of around 100 km ² . 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 brisingids. The mounds support significant populations of the xenophyophore <i>Syringammina fragilissima</i>
North West Rockall Bank cSAC/SCI	Iceberg ploughmarks containing cobbles and boulders provide stony reef habitat. Associated biological communities include <i>Reteporella</i> sp., <i>Caryophyllia</i> sp., serpulid worms and a large variety of sponge species. Interspersed with the stony reef, biogenic reef occurs as <i>Lophelia pertusa</i> reef. Associated species include erect sponges, the pencil urchin <i>Cidaris cidaris</i> and stands of the cold water coral, <i>Madrepora oculata</i> . Cobble rubble surrounds the living reefs in many places, and supports fauna such as the squat lobster <i>Munida rugosa</i> , the holothurian <i>Stichopus tremulus</i> , brittlestars and encrusting yellow sponges.
Anton Dohn Seamount cSAC	Hard bedrock reef of low topographic complexity, stony reef, and biogenic <i>Lophelia pertusa</i> 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, <i>Lophelia pertusa</i> and soft corals. Biogenic reef is formed by live <i>Lophelia pertusa</i> reef and sediment in-filled dead <i>L. pertusa</i> frameworks.

Three of the sites represent different types of Annex I reef; the Darwin Mounds supports biogenic reef, NW Rockall Bank supports both *L. pertusa* biogenic reef and stony reef, and East Rockall supports a mixture of bedrock, stony and biogenic reef. Anton Dohn represents a seamount and supports a mixture of bedrock, stony and biogenic reef. Biogenic reefs have not been widely observed in the UK deep-sea environment, although limited survey of these regions has been undertaken (Long *et al*, 2010). Recommendation of all these sites within the same Regional Sea is justified partly because of the differences between the reef types at each site (structure and associated communities) to ensure the variation of types is represented in the network of SACs, and partly to ensure sufficient proportion of the total UK resource of reef is included within the UK SAC network (JNCC, 2009). The UK location of reef, including *Lophelia* and deep circalittoral reef types, is concentrated in waters to the west and north of Scotland, hence the greater number of sites recommended for these reef types in Scottish waters compared to the rest of UK waters.

Within adjacent regional seas nine other areas have been proposed or are being considered for their Annex I reef. These are shown below with its characteristic features.

SAC	Notable characteristics of the Reef interest feature
Sanday SAC (Scottish Continental Shelf Regional Sea)	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 <i>Laminaria</i> spp (to 20m depth) provide a habitat for species-rich, red algal turf communities. Sponges (e.g. <i>Clathrina coriacea</i>) and ascidians (e.g. <i>Aplidium punctum</i>) 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 (<i>Modiolus modiolus</i>) beds in mixed sediment below the kelp zone.
Papa Stour SAC (Scottish Continental Shelf Regional Sea)	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 <i>Alcyonium digitatum</i> , the featherstar <i>Antedon bifida</i> , encrusting coralline algae and the serpulid worm <i>Pomatoceros</i> , with turfs of the jewel anemone <i>Corynactis viridis</i> , ascidians and bryozoans. Scour-tolerant organisms such as the hydroid <i>Abietinaria abietina</i> and the brittlestar <i>Ophiocomina nigra</i> are also present.
North Rona SAC (Scottish Continental Shelf Regional Sea)	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 (Scottish Continental Shelf Regional Sea)	Bedrock, stony and biogenic reef (<i>Modiolus modiolus</i>) 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 <i>Laminaria hyperborea</i> . Bedrock and boulders below the kelp forest are heavily grazed but coralline algae, the keel worm <i>Pomatoceros triqueter</i> and the soft coral <i>Alcyonium digitatum</i> , may be present. There is a well-established horse mussel, <i>Modiolus modiolus</i> reef throughout the channel.
St Kilda SAC (Scottish Continental Shelf Regional Sea)	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.

<p>Stanton Banks cSAC/SCI</p> <p>(Scottish Continental Shelf Regional Sea)</p>	<p>Stanton Banks are a series of granite rises which outcrop from the seafloor south of the Outer Hebrides. Although rounded by glacial action, they remain deeply fissured and extremely rugged. The inter-connecting gullies are filled with rippled coarse shell sand. 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, crinoids (featherstars), dead man's fingers, <i>Alcyonium digitatum</i> and hydroid corals are abundant. At their edges, the banks are fringed with boulders and cobbles.</p>
<p>Solan Bank cSAC</p> <p>(Scottish Continental Shelf Regional Sea)</p>	<p>This site presents highly topographic bedrock and smooth, undulating bedrock reef outcrops and stony reef (comprised of boulders and cobbles) in a range of depth zonations from the infralittoral to deep circalittoral and within a range of energy levels with a resulting broad range of ecological communities and faunal diversity. The reefs support encrusting bryozoans, encrusting coralline algae, caryophyllid cup corals and ophiuroids. Highly sediment scoured bedrock is mainly colonised by the keel worm <i>Pomatoceros triqueter</i>. Less scoured bedrock support a range of sponges, bryozoans and hydroids. In shallower areas with increased water movement there is an increasing abundance of the soft coral, <i>Alcyonium digitatum</i>, the cup coral, <i>Caryophyllia smithii</i> and the jewel anemone, <i>Corynactis viridis</i>, with red algae and kelp in the shallowest areas.</p>
<p>Wyville Thomson Ridge cSAC/SCI</p> <p>(in both Scottish Continental Shelf Regional Sea and Faroe-Shetland Channel Regional Sea)</p>	<p>The Wyville Thomson Ridge is a rock ridge situated in the Atlantic Ocean at the northern end of the Rockall Trough. It is approximately 20km wide and 70km long and rises from over 1000m depth to less than 400m at the summit. The Ridge is composed of extensive areas of stony reef interspersed with gravel areas and bedrock reef along the flanks. The rock and stony reef areas support diverse biological communities, representative of hard substratum in deep water, including a range of sponges; stylasterid, cup and soft corals; brachiopods; cyclostome bryozoans; dense beds of crinoids and ophiuroids; echinoids (sea urchins), holothurians and pycnogonids (sea spiders). Communities on the bedrock reef vary in species composition between the two sides of the ridge due to the influences of different water masses. This combination of water masses in one area is unique in UK waters.</p>
<p>Hatton Bank cSAC</p> <p>(Atlantic North West Approaches Regional Sea)</p>	<p>Hatton Bank is a large volcanic bank, situated in the Atlantic North-West Approaches, towards the western extent of the UK Continental Shelf. The vast size and topographic complexity of the Hatton Bank supports a wide diversity of biological communities, each associated with different geomorphological structures and substratum types. The bank supports extensive areas of Annex I bedrock reef (particularly on the ridges along the top of the bank) and stony reef. Also present are elaborate cold water coral reefs, frequently associated with topographically distinct features, including pinnacles and mounds tens of metres in height and hundreds of metres in width.</p>

Note: cSAC = candidate SAC (site approved by Government)
 SCI = Site of Community Importance adopted by the EC
 See <http://jncc.defra.gov.uk/page-4168> for flow diagram

As well as being in adjacent Regional Seas, all nine sites above support different sub-types of reef and have different characteristics, as well as contributing to the proportion of the UK

reef resource included within the SAC network. Many of the assemblages found at East Rockall Bank, particularly on bedrock and stony reef at depths of ~200-500m, have not been observed from other regions of the UK Continental Shelf due to a lack of suitable habitat at these depths (Long *et al*, 2010). This site therefore represents a different range of habitats and species to those protected within the current UK offshore Natura network.

8. Site boundary

The cSAC boundary for East Rockall Bank 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 (JNCC, 2008). Depth within the East Rockall Bank site varies considerably as it traces the eastern and north-eastern edges of Rockall Bank. The Annex I reef habitats are located at depths between 400m and 600m on the western side of the site, and between 1000m and 1200m on the eastern side of the site. Assuming a ratio of 2:1 fishing warp length to depth on the continental shelf, the cSAC boundary is defined to include margins of 800m and 1200m from the reef features on the western side, relative to associated depths, and 2000m and 2400m from the reef features on the eastern side, relative to associated depths.

On the eastern edge of the Rockall Bank summit and to the west of the site boundary, small areas of Annex I stony reef on iceberg ploughmarks were identified from the multibeam and seabed imagery data. The video tows in this region have been analysed, and do not reveal a large extent of stony reef. Instead the reef is fairly patchy, being interspersed with large areas of sandy substrate. These areas of stony reef have not been included within the site boundary as they represent a minimal extent of Annex I stony reef in comparison to that already present within the site boundary. Excluding this area also reduces the amount of non-Annex I habitat contained within the site boundary. The habitats identified on the ploughmark features are also observed elsewhere on the Rockall Bank summit, and these are protected within the NW Rockall cSAC. Irving (2009) provides further UK interpretation of the definition criteria of stony reef.

Annex I features at the southern section of the bank extend beyond the UK/Ireland agreement of area delimitation in the Hatton-Rockall section of the continental shelf and are therefore not included within this site.

Note that the boundary is for the 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

East Rockall Bank is located in the Rockall Trough and Bank Regional Sea and represents hard bedrock reef of low topographic complexity, stony, and biogenic *Lophelia pertusa* reef in the deep circalittoral to bathyal zone. The site is located in full salinity waters with no coastal influence and moderate energy levels.

The site represents the most complex habitats on the Rockall Bank geological feature. It comprises steep slopes, mixed substrates of boulder, cobbles and pebbles with areas of exposed bedrock and bedrock outcrop, with no one habitat type dominating (Howell *et al*, 2009).

The site supports all three Annex I reef sub-types, with a diverse range of associated fauna. Bedrock and stony reef along the steep cliff feature supports stylasterid corals and lobose and encrusting sponges. This habitat has not been observed elsewhere within the UK continental shelf, likely due to the depth of the feature which is shallower than most other deep sea structures (Long *et al*, 2010). Sediment in-filled dead *Lophelia pertusa* framework representing biogenic reef is situated on small mound features. Live biogenic reef is also represented on parasitic cones and in association with bedrock reef to the north of the site. However, no large clumps of *Lophelia pertusa* reef comparable to those occurring in the neighbouring North West Rockall site have been found in abundance on the eastern summit edge. Instead, semi-buried coral fragments are common, suggesting cold water coral reef has been damaged by fishing activity (Howell *et al*, 2009). Fishing activity is known to be heavy on Rockall Bank, and trawl scars on the bank are evident in the multibeam backscatter data collected on the 2009 JNCC survey (Long *et al*, 2010).

Given that the site has been subject to some damage from bottom trawling (Howell *et al* 2009), the grade for the feature is B: good representativity.

b) Area of habitat

The reef feature is approximately 62,471ha (624km²) in area (flat mapped extent). This has been estimated from a review of multibeam, sidescan sonar and seabed imagery data. 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 7,180,000 and 1,077,000 ha (15-100% of total resource)

B – extents between 1,077,000 and 143,600 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

Fishing is widespread over Rockall Bank with cod, haddock and halibut being targeted for more than two centuries (Howell *et al*, 2009). Russian, German and French trawlers also target blue ling, roundnose grenadier, black scabardfish and deepwater sharks in the deeper waters, as well as hake, blue whiting, monkfish and *Nephrops* (Howell *et al*, 2009).

Fishing activity at East Rockall Bank is apparent from trawl marks detected on the multibeam backscatter and sidescan sonar data collected during the 2009 JNCC survey (Long *et al*, 2010). These trawl marks are frequent on the top of East Rockall Bank and on terraces on the cliff feature. VMS bottom trawl data also indicates demersal fishing is widespread on the eastern summit edge and along the escarpment, particularly over the stony reef. Demersal fishing looks to be minimal over the reef features towards the east of the site boundary, likely due to the greater depth of the site here. Discarded fishing gear was seen in a number of photos taken at Rockall Bank, including a bundle of netting lying on top of small pieces of coral (Long *et al*, 2010).

Coral rubble occurring on the eastern summit edge was seen during the 2009 JNCC survey. This suggests thickets of *Lophelia pertusa* found on previous surveys (Wilson, 1979a and b) may have been damaged by trawling, since evidence of fishing activity, i.e. discarded gear, was found in association with the rubble area. Semi-buried coral fragments seen on the 2005 DTI survey (Howell *et al*, 2009) indicate that reef may have been abundant on the eastern summit region prior to fishing activity. Further rubble was observed in the northern section of the eastern flank from the NOC 2011 survey (Huvenne, 2011) although other areas of cold water coral reef remain intact on this eastern flank and no damage is apparent to stony and bedrock reef where faunal communities are in abundance.

The area is currently not exploited for oil and gas, so no pipelines or installations occur at the site.

Assuming no further damage has occurred to the features, the grading is II: structure well conserved.

Degree of conservation of functions

The prospects of the reefs to maintain their structure in the future, taking into account unfavourable influences and reasonable conservation effort, are good. NEAFC and the European Commission have closed a significant part of Rockall Bank, where the NW Rockall Bank cSAC is located, to demersal fishing at the recommendation of ICES. A closure over East Rockall Bank was also proposed by the ICES Working Group on Deep-water Ecology (WGDEC) in 2007 (ICES, 2007), based on DTI surveys of the area in 2005/2006 and VMS data. Additional fisheries data, from the Scottish Fisheries Protection Agency was considered in 2009. This data indicated active demersal fishing that coincided with areas of coral records from 2005/06 surveys but also less fishing on the eastern and western edges of the boundary that coincided with coral locations. WGDEC considered that there remained sufficient justification for a closure to protect coral reefs on East Rockall, with modifications to the boundary due to the new fisheries data. Consideration of this closure was delayed until results from the JNCC 2009 survey were available. The 2009 JNCC survey data subsequently assessed at the 2011 WGDEC meeting provided very few additional *Lophelia* reef occurrences. In addition, these reefs were found on the top of mound features which would in themselves offer protection as these features would tend to be avoided by fishing practices. VMS data (2006-2010) (Cefas, 2010) indicates that there is significant otter bottom trawling to the west of the cSAC boundary where coral rubble was observed on the JNCC survey. With that level of fishing and few new occurrences of *Lophelia* reef a closure on the summit of the bank was deemed unnecessary.

Regulations are in place to manage industrial oil and gas activity in and around SACs in the UK Continental Shelf Designated Area, and the laying of submarine cables and pipelines also requires regulatory consent. The site is distant from terrestrial sources of pollution.

The grading is II: good prospects.

Restoration possibilities

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 on bedrock and stony reef if activities causing physical damage were removed.

Lophelia pertusa reef is known to develop over tens of years (Bell and Smith, 1999; Roberts, 2002), however substantial biogenic reef structures have been found to be thousands of years old (Freiwald *et al*, 2004) and are particularly sensitive to physical damage, particularly if the hard substrata on which they grow are also removed or subject to sediment deposition (Shelton, 1980; Mortensen, 2001). The decrease in observations of *Lophelia pertusa* reef at East Rockall Bank on the DTI and JNCC surveys (Howell *et al*, 2009; Long *et al*, 2010) compared with that found by Wilson (1979a and b) suggests *Lophelia pertusa* thickets have been heavily impacted by bottom trawling and no recovery has occurred. Although recent research suggests that stony (scleractinian) corals do not recover from trawling impact quickly, with one study showing no signs of recovery on trawled seamounts after 5 and 10 years (Williams *et al*, 2010), *L. pertusa* is known to grow at a rate of 6mm /year (Wilson, 1979), and therefore in the absence of detrimental activities and in association with hard substratum, it could recover but extremely slowly.

Due to the high sensitivity of biogenic reef to trawling impact at the site, the grading is III: restoration difficult or impossible.

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) to c) are B, C and B. Given these evaluations, and taking into account the rarity of this habitat in UK waters, 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
East Rockall Bank	B	C	B	B

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

a) Size and density of the population of the species present on the site

Harbour porpoise (*Phocoena phocoena*) is found throughout the majority of UK continental shelf waters, with very few sightings off the continental shelf area (Reid *et al.*, 2003; SCANS II, 2008). There are no records of the species within the boundaries of East Rockall Bank cSAC (Evans *et al.*, 2003; Reid *et al.*, 2003, CODA, 2009) and therefore the species is not considered a feature of the site. However, there have been some sightings to the east, outside of the site and as they are highly mobile, the assessment may change if new data become available.

9.3. Bottlenose dolphin (*Tursiops truncatus*) - Annex III selection criteria (Stage 1B)

a) Size and density of the population of the species present on the site

This species 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). There are no records of bottlenose dolphin occurrences within the cSAC boundary (Reid *et al.*, 2003; CODA, 2009) therefore the species is not considered a feature of the site. However, dolphin click trains (potentially bottlenose dolphins) have been recorded in the vicinity of the site (CODA, 2009). Consequently, this assessment may change if new data becomes available.

9.4. Grey seals (*Halichoerus grypus*) - Annex III selection criteria (Stage 1B)

a) Size and density of the population of the species present on the site

There are no records of grey seal occurrences within the cSAC boundary and therefore the species is not considered a feature of the site. This assessment 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) seals (*Phoca vitulina*) - Annex III selection criteria (Stage 1B)

a) Size and density of the population of the species present on the site

There are no records of harbour seal occurrences within the cSAC boundary and therefore the species is not considered a feature of the site. This assessment 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.

10. Sites to which this site is related

None

11. Supporting scientific documentation

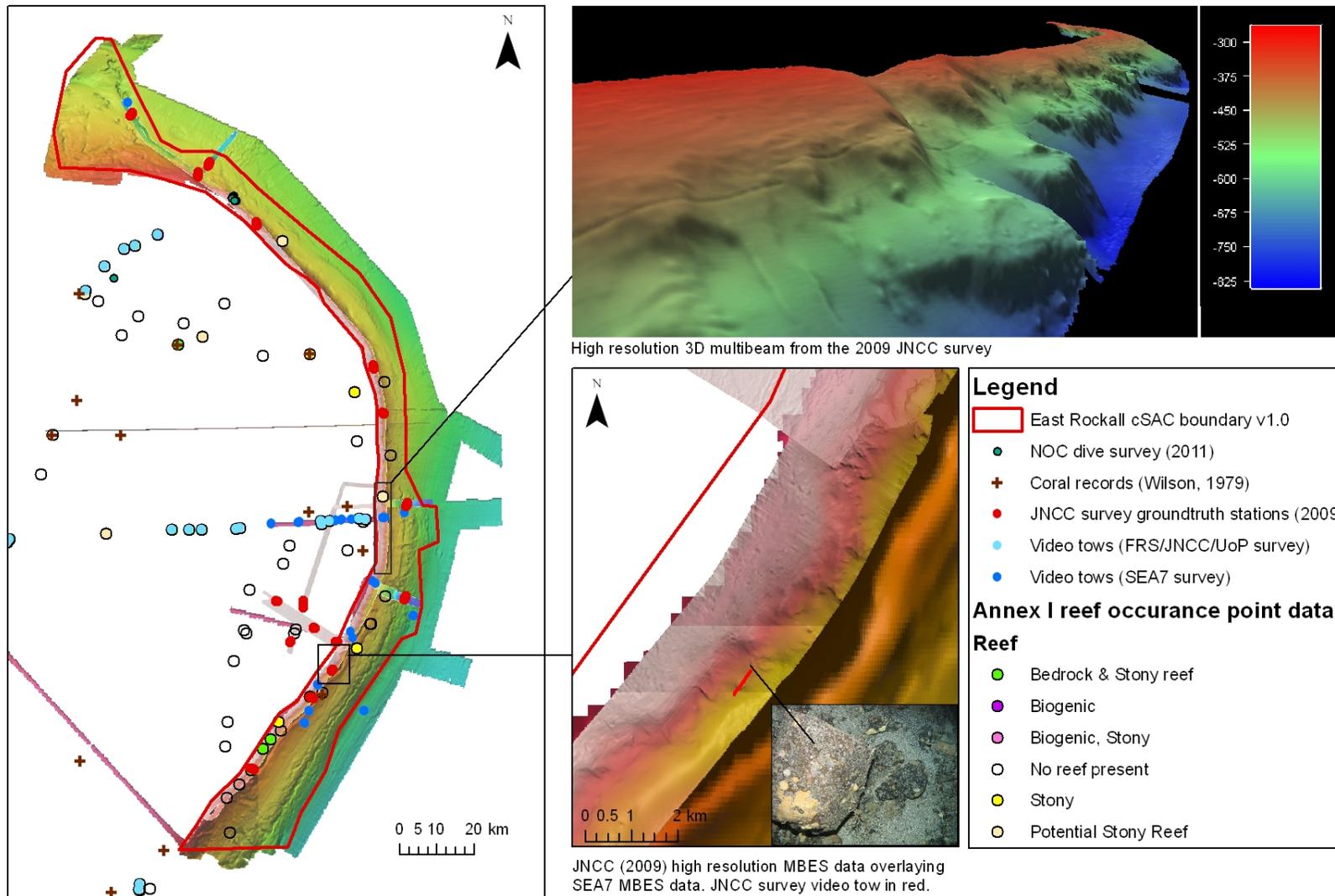
A wide range of exploratory research has been undertaken in the Rockall Trough, with several major research programmes targeting the area (Howell *et al.*, 2009). The majority of

this data has been collected on soft sediment habitats on the continental shelf (Howell *et al*, 2009). However advances in sampling techniques, including video and camera work, have enabled detection of bedrock (Hitchen *et al*, 2002) and cold-water coral reefs on Rockall Bank (Wilson, 1979a and b), including large reef structures on the eastern flank below 500m depth.

Further research was undertaken by the Department of Trade and Industry (DTI) (now DECC) in 2005 on two Strategic Environmental Assessment (SEA7) surveys aboard the *SV Kommander Jack*, and on two Fisheries Research Services (FRS) Marine Laboratory (now Marine Scotland Science) surveys in 2005 and 2006 aboard the *R/V Scotia*, with participation from JNCC and Plymouth University. The first SEA7 survey undertook multibeam data collection on Rockall Bank, including the eastern summit edge and flanks, and a single transect of sidescan sonar across Rockall Bank, which crossed the eastern summit and flanks (Howell *et al*, 2009). Video and stills imagery data was collected on the second SEA7 survey using a drop frame camera system, and further imagery was undertaken on the FRS/JNCC surveys (Howell *et al*, 2009). Sample stations from the SEA7 surveys were located on the East Rockall flank and these have been used to aid the identification of Annex I habitat in the East Rockall Bank candidate SAC.

Additional data collection was undertaken on a JNCC commissioned survey in 2009 aboard the *M/V Franklin* (Stewart *et al*, 2009; Long *et al*, 2010). During this survey a double swath of multibeam echosounder data was acquired along the East Rockall escarpment on the eastern flank of Rockall Bank. Alongside this, additional survey lines were completed to characterise interest features observed from the SEA7 multibeam data and over the iceberg ploughmarks on the eastern summit edge. Sidescan sonar backscatter data was collected across the Area of Search. Stills and video data to groundtruth the acoustic data were also collected using a drop frame camera. (Appendix I, a-d)

A recent survey to Rockall Bank was undertaken by the National Oceanography Centre (NOC) Southampton (Huvenne, 2011). High resolution sidescan from Autosub6000, multibeam echosounder data and video and stills imagery data were collected (Huvenne, 2011). This data has yet to be analysed and so mapping of the extent of the reef observed is not possible at present.



Map projected in UTM (Zone 28N, 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). GEBCO bathymetry © NERC 1994, 1997. Map copyright JNCC 2012, V1.1, created by DB.

Figure 1. Survey data gathered at East Rockall Bank. Data shown on the map includes that obtained during the FRS/JNCC/UoP surveys in 2005 and 2006 (Howell *et al* 2009), the SEA7 surveys in 2005, the JNCC commissioned survey in 2009 (*note: MBES multibeam echosounder and backscatter*), and the 2011 NOC surveys. Locations of corals recorded by Wilson (1979a and b) are also included.

12. Site overview and conservation interest

Rockall Bank is located in the Rockall Bank and Trough Regional Sea and is approximately 450km long and 200km wide, lying in a northeast to southwest orientation. The depth varies across the bank from 0m, where a rocky island outcrop breaks the sea surface, to 1000m. The eastern and north eastern edge of the bank drops steeply from 250m to a maximum of about 1500m into the Rockall Trough. The western and southern slopes are less steep and descend into the Rockall-Hatton Basin at around 1000m.

The Rockall Bank has been surveyed extensively, primarily by geological coring on the soft sediments. Advances in technology have since enabled a number of surveys to collect data on the deep-water rock habitats. Of particular interest is observation work undertaken on the submersible Pisces III by Wilson (1979a and b), where patchily distributed cold water coral communities were discovered (see Figure 1). The majority of these coral colonies and thickets occur on the shallower parts of Rockall Bank, around 150-400m depth and have been further studied on more recent surveys in 2005 and 2006 (Howell *et al*, 2009) and are included as features of the North West Rockall cSAC. In addition to these cold water coral reefs, rocky outcrops, rock ridges and boulder fields occur across Rockall Bank (Howell *et al*, 2009). Current flow is cyclonic and is stronger on the eastern and north eastern slopes of the bank (New and Smythe-Wright, 2002).

The eastern edge of Rockall Bank was surveyed in 2005 and 2006 (Howell *et al*, 2009). Further data was collected on a JNCC commissioned survey in 2009, identifying a number of Annex I reef features. On the eastern side of the summit of Rockall Bank at around 200m depth, areas of *Lophelia pertusa* coral rubble are found, that may potentially be a result of trawling damage to cold water coral thickets. Trawling is known to occur across Rockall Bank's summit as seen from VMS data and also due to the observations of locally discarded fishing gear. In addition, areas of fine sand scarred by iceberg ploughmarks are common. Bands of cobbles and boulders associated with the iceberg ploughmarks are interspersed with areas of mixed cobble and pebbly sand (Howell *et al*, 2009). Assemblages characterised by the anemone *Actinauge richardii* and *Caryophyllia smithii* are associated with the gravelly sand substrates, and within cobble areas, particularly on iceberg ploughmarks, characterising species include erect bryozoans (*Reteporella* sp.), *Munida rugosa*, axinellid sponges and encrusting sponges and zoanthids. These iceberg ploughmark habitats have been observed elsewhere on the Rockall Bank summit and are protected as part of the North West Rockall cSAC. On the summit of Rockall Bank, rock is thought to occur close to the seabed with a veneer of sediment over the top, and examples of this on the eastern edge were seen from seabed imagery collected in 2009 (Long *et al*, 2010). These bedrock areas support axinellid sponges, *Phakellia* sp., encrusting sponges and bryozoans, *Caryophyllia smithii*, *Pomatoceros triqueter* and *Reteporella* sp. (Long *et al*, 2010).

As the summit slopes towards the Rockall Trough, a break in slope occurs with inundations caused by slope failures. Along this break, a rocky escarpment outcrops running the length of the eastern flank. This escarpment is composed of bedrock reef and assemblages are characterised by lace corals (stylasterid) and lobose and encrusting sponges, with small colonies of *Lophelia pertusa*. The lace coral-sponge assemblage has not been recorded elsewhere within the UK continental shelf limit. This is most likely due to the depth of the rocky outcrop at ~450m, which is shallower than most other known deep-sea structures supporting reef habitats (Long *et al*, 2010).

Extending deeper down the eastern flank slope, the substrate grades to boulder and cobble habitat representing stony reef. Here, the same assemblage exists but with a lower

abundance of lace corals and a higher abundance of sponges (Long *et al*, 2010). Substrate becomes finer with depth and assemblages vary from serpulids and *Munida* sp. on pebbles and gravels to sagartid and helcampid anemones, sea pens, caryophyllids and xenophyophores on gravelly sand and sandy gravels at more than 1000m depth. At the greatest depths the substrate consists of sandy muds and mud. In the northern section of the flank three pinnacles, most likely igneous extrusions known as parasitic cones, rise up to 100 - 200m in height. These cones support a diverse assemblage of sediment in-filled dead *Lophelia pertusa* framework and live cold water coral reef, with antipatharians and gorgonians. Dead *Lophelia pertusa* framework likely forms as part of the growth stages of *Lophelia pertusa*, where older colonies die-off, providing substrate for further growth of new colonies (Wilson, 1979b). These Annex I reef areas represent biogenic reef. Further along the eastern flank, small mounds appear which support further examples of biogenic reef, in the form of dead *Lophelia pertusa* framework. Although not as diverse as the biogenic reef found on parasitic cones, this framework supports many associated species. Further examples of bedrock, biogenic and stony reef were observed in this northern section by a NOC survey (JC060). (Huvenne, 2011).

Two canyon features, as identified by multibeam imagery collected on the 2009 JNCC survey and groundtruthed with video and stills data, cut into the flanks of Rockall Bank and extend eastwards to the Rockall Trough. These are likely caused by slope failure events. Both are characterised by xenophyophores and decapod shrimps. The more northerly canyon is about 500m wide with a rippled seabed, suggesting strong current flows. Here, dense aggregations of suspension feeding Caryophyllid corals occur on the canyon floor with sea pens on the canyon flanks.

Video and stills imagery analysis enabled the identification of thirteen biotopes at East Rockall Bank (see Table 1). Seven of these have previously been recorded in association with other deep sea structures in UK offshore waters, including Hatton Bank cSAC and Wyville-Thomson Ridge cSAC (Long *et al*, 2010). These seven biotopes were previously proposed by Howell *et al* (2010) and have been submitted to JNCC for further investigation prior to updating the classification. In addition, the biotope *Reteporella* bryozoan and axinellid sponges on mixed substrate, is similar to the circalittoral deep sponge community biotope, CR.HCR.DpSp.PhaAxi, which has been recorded elsewhere within the continental shelf (Mitchell, 2005). Five new biotopes were observed at East Rockall Bank (Long *et al*, 2010) and have been submitted to JNCC for further investigation. The occurrence of these new biotopes is likely due to the great range in depth of the site (200-1500m), providing suitable faunal habitats at a variety of depths compared with other previously surveyed deep sea sites.

Table 1. Summary of biotopes identified at East Rockall Bank from video and stills data analysis.

Biotope Name	Characterising species	Substrate	Supporting reference
Edwardsid anemones on coarse/gravelly sand	Edwardsid anemones	Coarse sand/gravelly sand	Howell <i>et al</i> , 2010
<i>Caryophyllia smithii</i> & <i>Actinauge richardi</i> on sand/gravelly sand	<i>Caryophyllia smithii</i> and <i>Actinauge richardi</i> anemones	Sand/gravelly sand	Newly proposed
Halcampoid anemones on coarse sand	Halcampid anemones	Coarse sand	Howell <i>et al</i> , 2010
Xenophyophores and sea pens on gravelly sand and mixed substrate	Xenophyophores, halcampids, anemones, cerianthids, ophiuroids and sea pens	Gravelly sand and mixed substrate	Newly proposed
Xenophyophores and pandalid shrimp on coarse sand and gravel	Xenophyophores, halcampids, anemones and hydroid turf	Coarse sand and gravel	Newly proposed
Live biogenic coral reef	Dead and live <i>L. pertusa</i> , <i>Madrepora oculata</i> , <i>Cidaris cidaris</i> , anemones, <i>Munida</i> sp., Gorgonians and <i>Leiopathes</i> sp.	Bioherm Annex I	Howell <i>et al</i> , 2010
Various sponge forms, corals and ascidians on mixed, boulder and ledges	Encrusting, globose and lamellate sponges, caryophyllids, <i>Stichopathes</i> , ascidians	Mixed, boulders and ledges <i>Annex I</i>	Newly proposed
Stylasterids and lobose sponges on bedrock and mixed substrate	Saddle oysters, brachiopods, <i>Munida</i> , serpulids, Stylasterids, <i>Cidaris</i> and Lobose sponges	Bedrock and mixed <i>Annex I</i>	Newly proposed
Reteporella bryozoan and axinellid sponges on mixed substrate	Reteporellid bryozoans, <i>Munida</i> , axinellid sponges and encrusting sponges and zoanthids	Mixed <i>Annex I</i>	Connor <i>et al</i> , 2004
<i>Munida</i> , saddle oysters and caryophyllids on mixed substrate	<i>Munida</i> , encrusting sponges, saddle oysters, serpulids and caryophyllids	Mixed <i>Annex I</i>	Howell <i>et al</i> , 2010
<i>Munida</i> and serpulids on mixed and biogenic gravel	<i>Munida</i> and serpulids	POS, mixed and BIOG	Howell <i>et al</i> , 2010
<i>Cidaris cidaris</i> and <i>Stichopus</i> on sand	<i>Cidaris cidaris</i> and <i>Stichopus tremulus</i>	Coarse sand	Howell <i>et al</i> , 2010
Serpulids, encrusting sponges and <i>Cidaris</i> on mixed substrate	Serpulids, encrusting sponges and <i>Cidaris cidaris</i>	Mixed <i>Annex I</i>	Howell <i>et al</i> , 2010

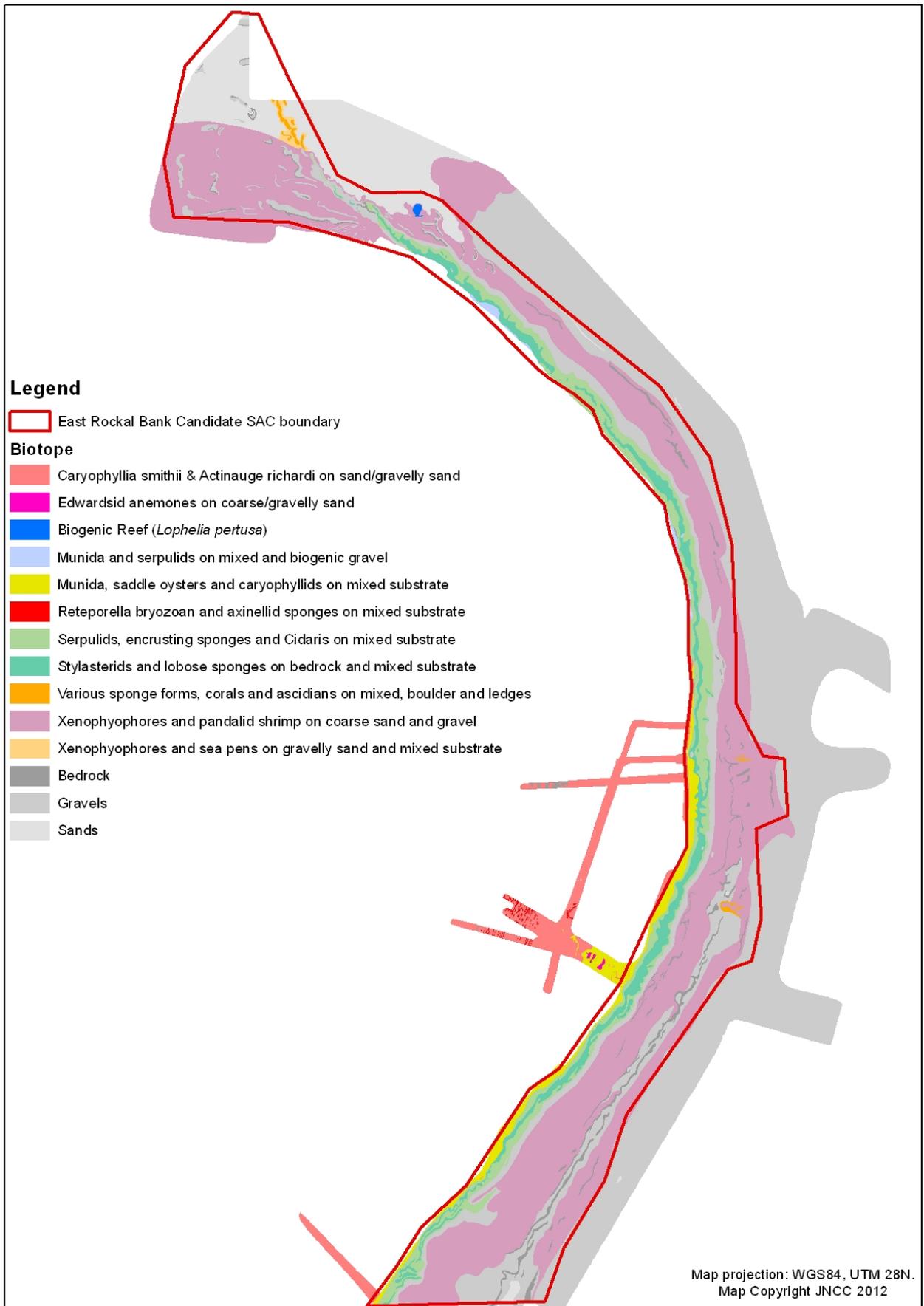


Figure 2. Biotope map illustrating distribution of biotopes identified by Long *et al* (2010).

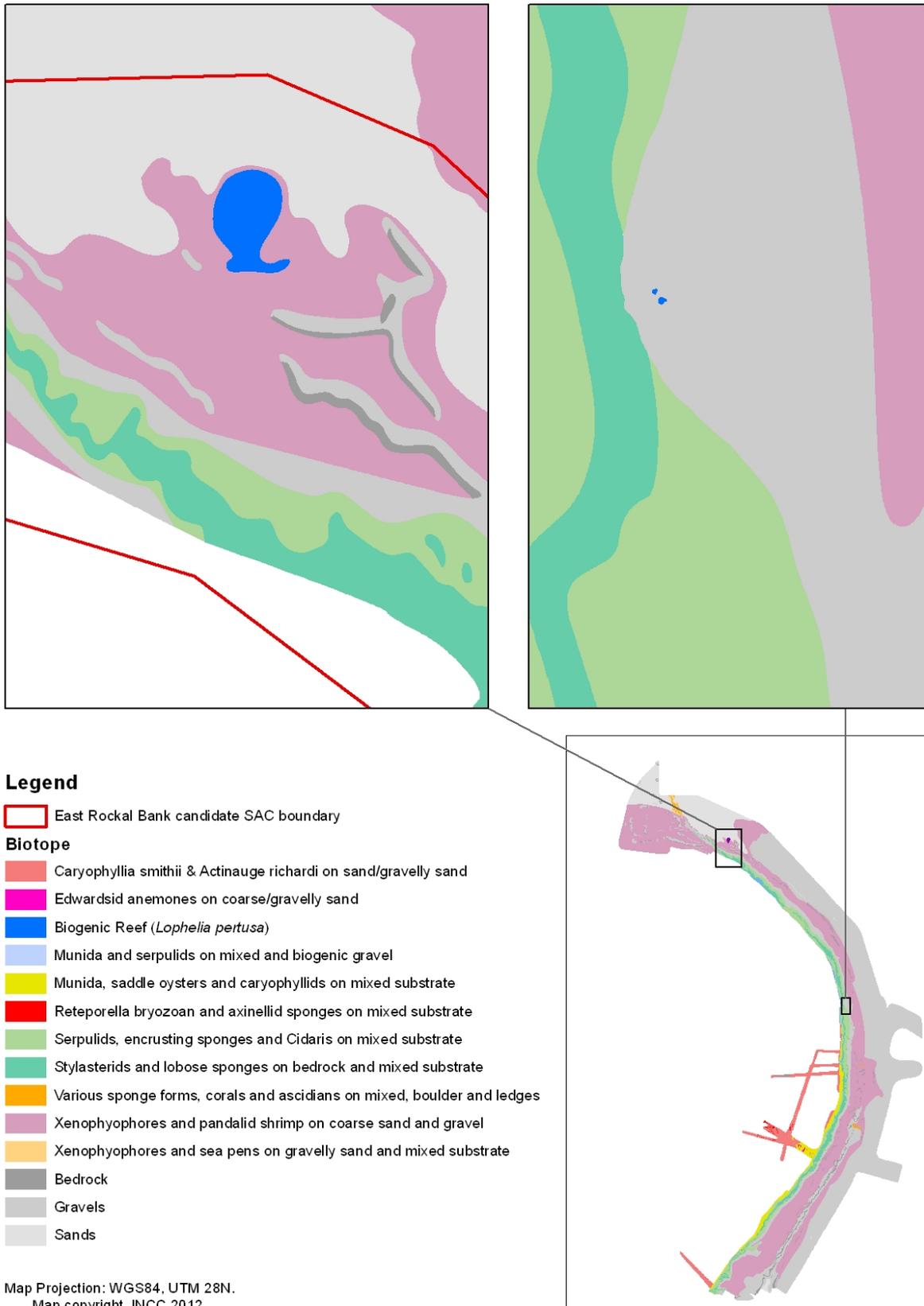


Figure 3. Close up section of biotope map illustrating distribution of biotopes identified by Long *et al* (2010).

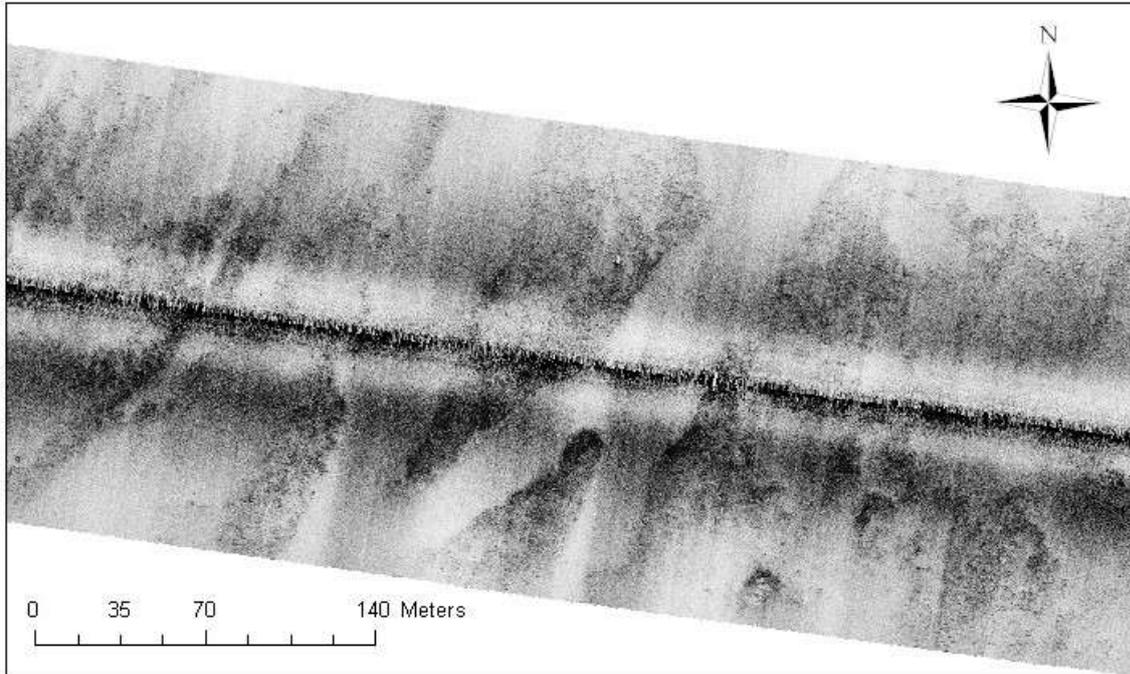


Figure 4. Sidescan sonar image of degraded iceberg ploughmarks on East Rockall Bank. Sidescan sonar data obtained from the Department of Trade and Industry SEA7 survey, 2005. (© DECC (formerly BERR)).

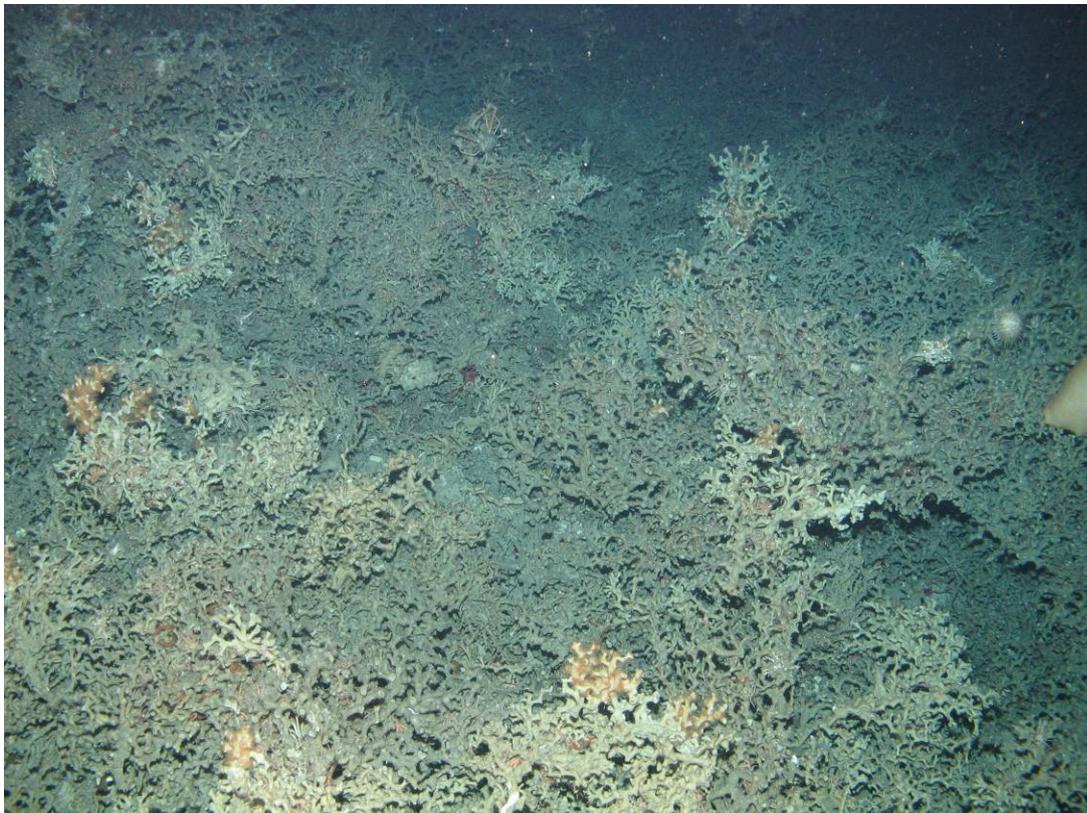


Plate 1. Dead *Lophelia pertusa* framework on a parasitic cone feature with *Cidaris cidaris*, *Henricia sanguinolenta*, *Ophiactis abyssicola* and *Ophiuroidea* sp. (Station ER_N_04, © JNCC).



Plate 2. Coral rubble on the eastern summit of Rockall Bank (station ER_C1_10, © JNCC).

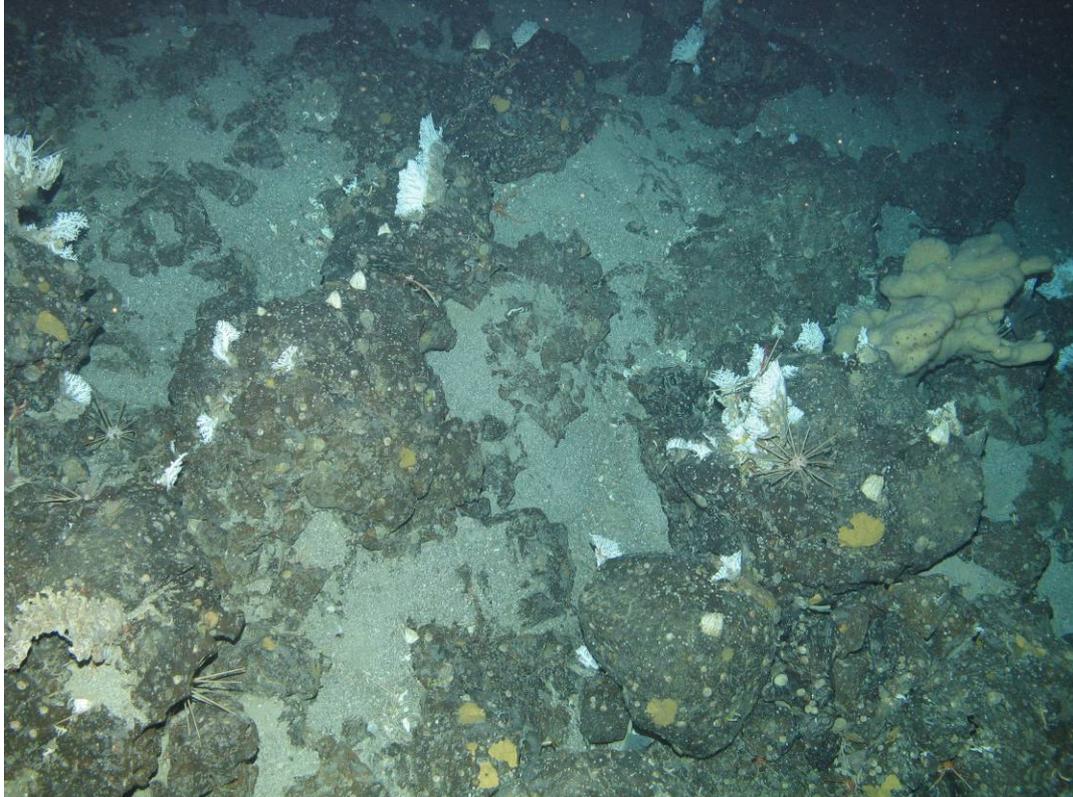


Plate 3. Stylasterids and lobose sponges on bedrock and mixed substrate (station ER_C2_05, © JNCC).

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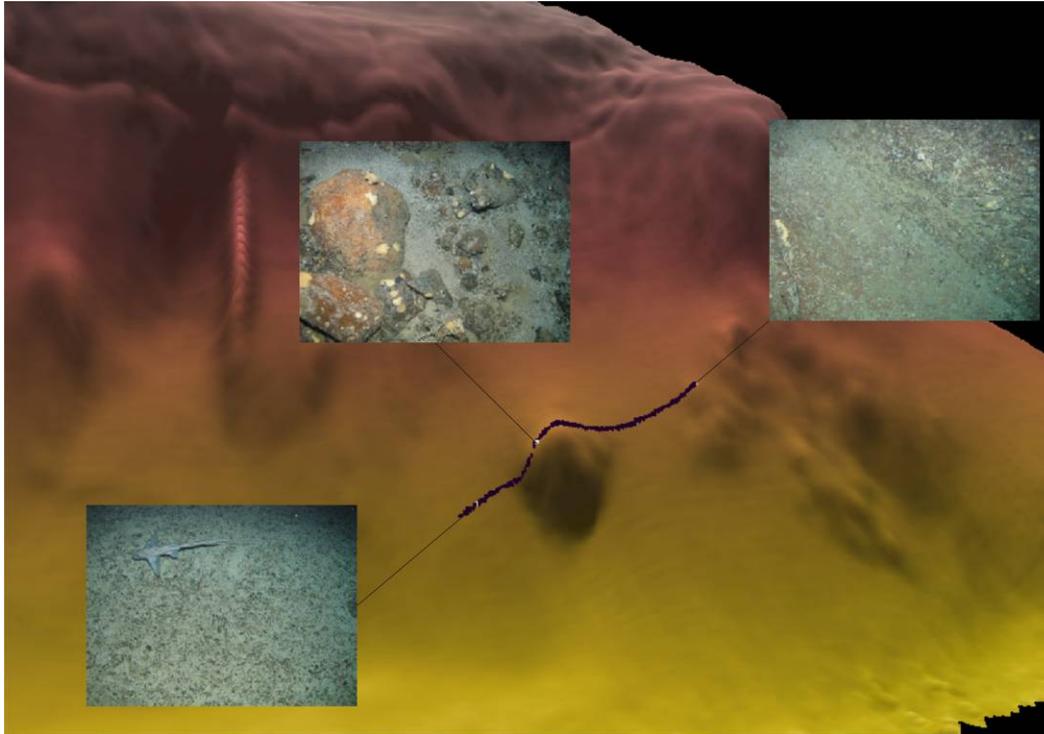
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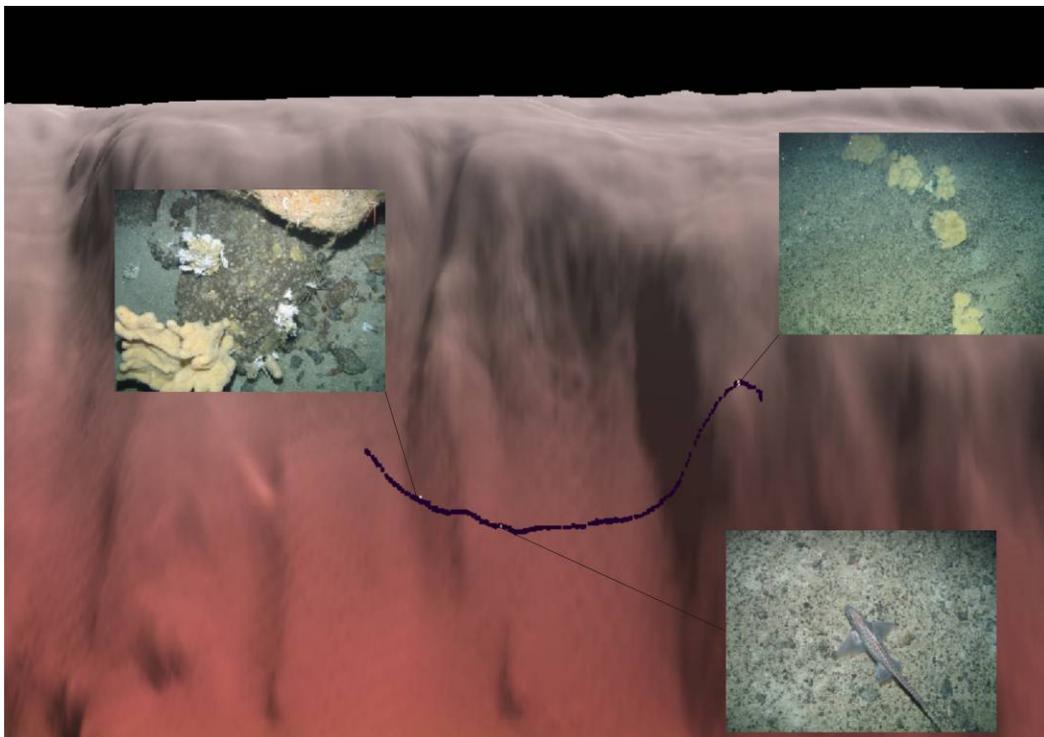
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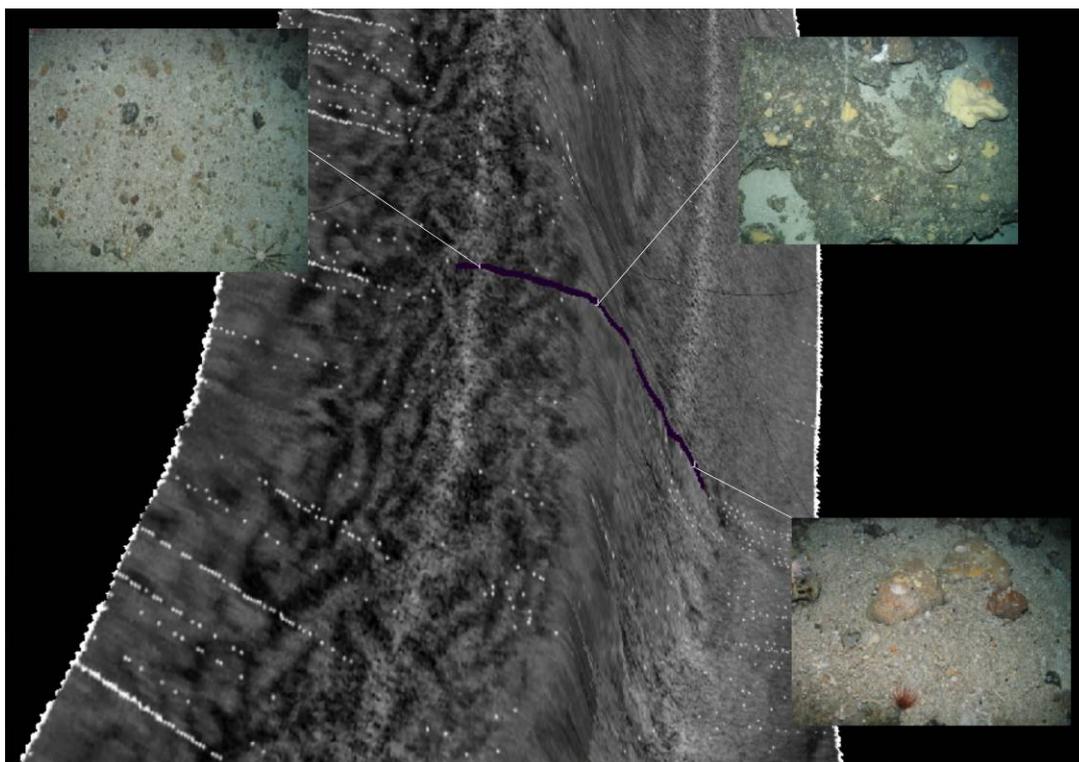
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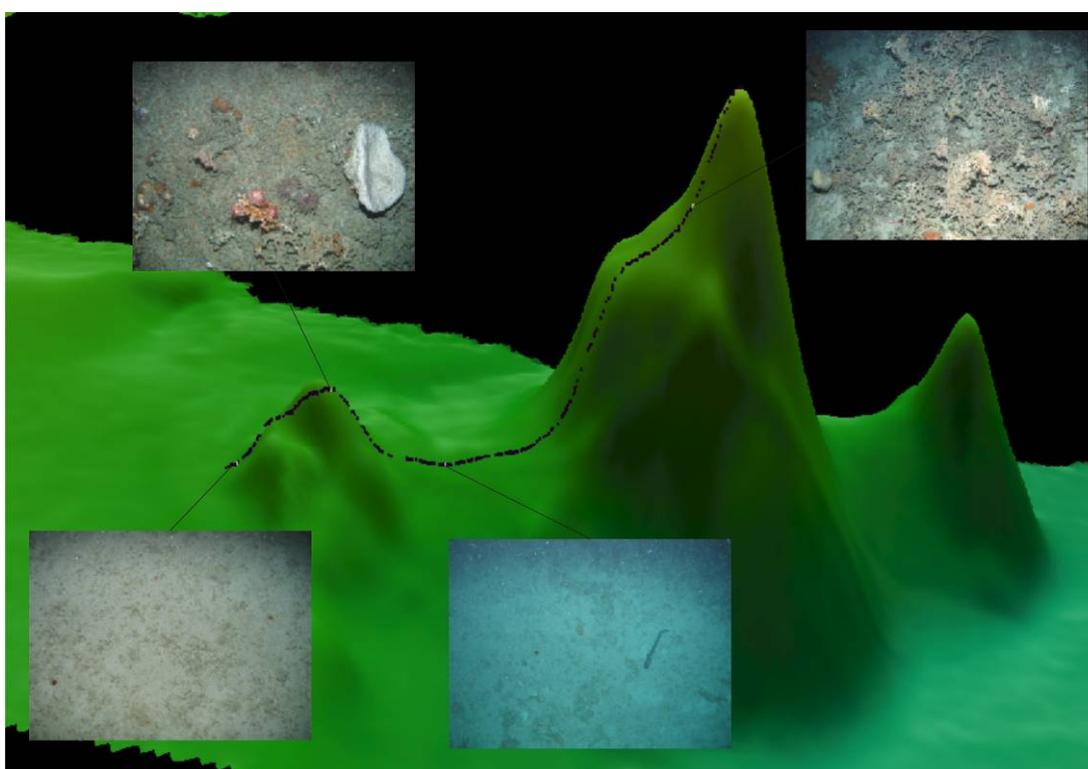
a. 3D multibeam bathymetry image of terraces at the base of the East Rockall slope with camera tow ER_S_20 draped. Selected images illustrate mixed substrate with abundant cidarids, and boulder and bedrock outcrops on a small mound feature.



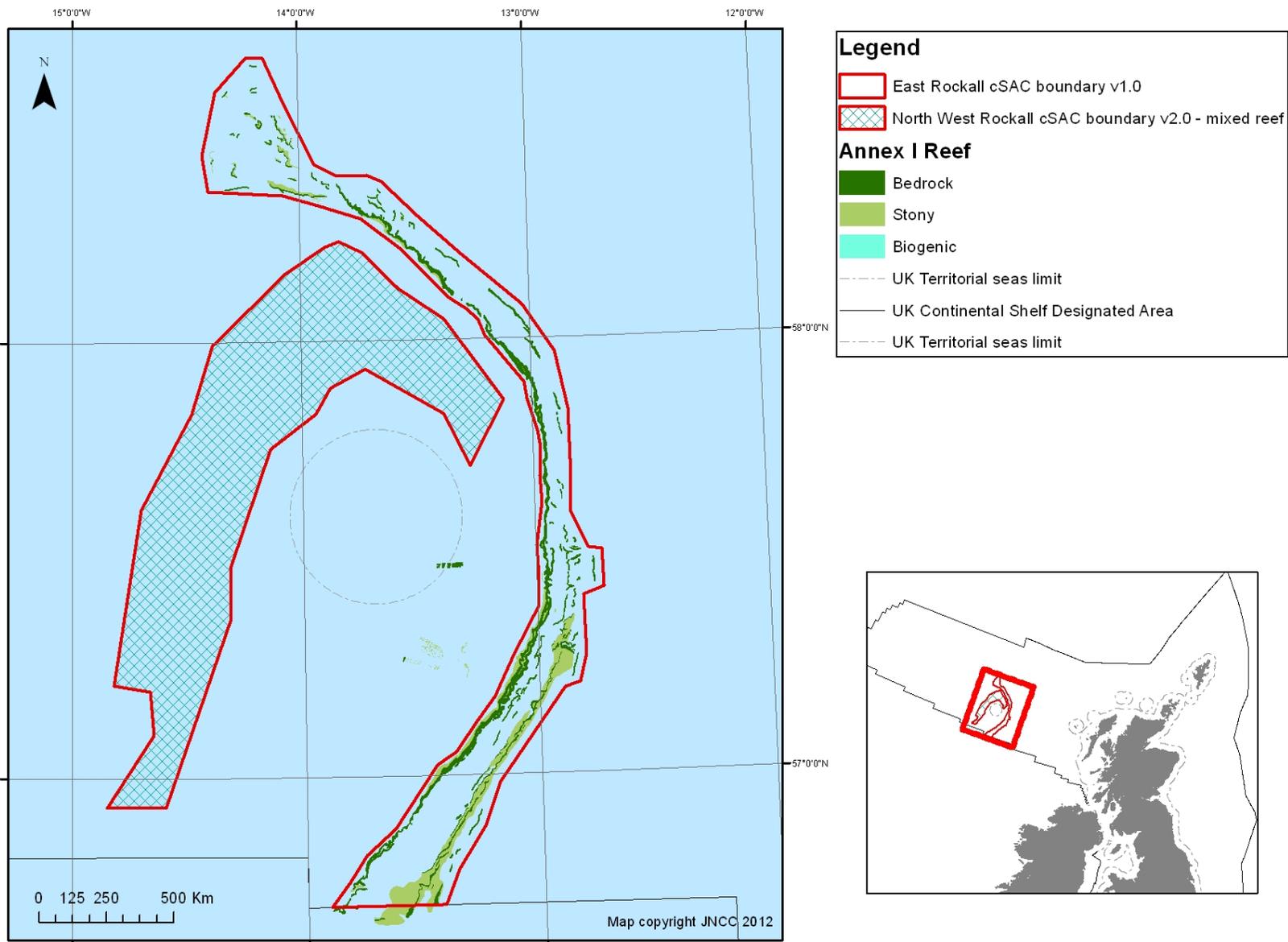
b. 3D multibeam bathymetry image of rocky ridge feature with the camera tow ER_C2_05 draped. Selected images illustrate mixed rock with stylasterid corals and lobose sponges, followed by mixed substrate with little visible epifauna and finally bedrock outcrop with more stylasterid corals and lobose sponges.



c. 3D multibeam backscatter image of iceberg ploughmarks with the camera tow ER_S_17 draped. Selected images illustrate mixed cobbles with biogenic gravel infill on iceberg ploughmarks, followed by bedrock and boulder outcrop further downslope.



d. 3D multibeam bathymetry image of deep water pinnacles with the camera tow ER_N_04 draped. Selected images illustrate low-lying coral rubble and live *Lophelia pertusa* reef on the largest mound with glass sponges and antipathrian corals. On the second, smaller mound, halcampoid anemones are in abundance with cup sponges, *Caryophyllia* and stylasterid corals.



e. Position of East Rockall in relation to North West Rockall cSAC.