Natura 2000
Fisheries management options paper

SOUTHERN NORTH SEA

HAISBOROUGH, HAMMOND AND WINTERTON SCI
INNER DOWSING, RACE BANK AND NORTH RIDGE SCI
NORTH NORFOLK SANDBANKS AND SATURN REEF SCI
MARGATE AND LONG SANDS SCI[1]
OUTER THAMES ESTUARY SPA

This is a working draft which has been produced to support early discussions with stakeholders about management.

[1] *Margate and Long Sands SAC is entirely within 0-12nm, thus management will be developed through the separate inshore SAC management process*.

1. Introduction

The purpose of this document is to support discussion of fisheries management options for four Special Areas of Conservation (SAC) and one Special Protection Area (SPA) in the Southern North Sea Regional Sea. The Southern North Sea extends from Flamborough Head in the north to Dover in the south. The main offshore habitats are large expanses of sands and coarser sediments (Defra, no date). All of the SACs have been selected for the Annex I habitats *sandbanks which are slightly covered by seawater all the time*. Three of the SACs have been selected for the Annex I habitat *reefs*. The Outer Thames Estuary SPA is classified for its wintering red-throated divers (*Gavia stellata*), listed in Annex I of the EC Birds Directive.

Sandbanks which are slightly covered by seawater all the time occur where areas of sand are predominantly surrounded by deeper water and where the water depth to the top of the sandbank is seldom less than 20 metres below chart datum. However, Annex I sandbank features may extend into waters deeper than 20m where it is considered that the biological communities in these deeper areas are integral to the function of the feature. SACs have been selected for sandbanks in UK waters to ensure that we have the full range of different sandbank types included in the SAC network and to ensure that we have sandbanks that have been selected throughout the full geographic range of the habitat.

A number of sites in the Southern North Sea Regional Sea have been selected to protect sandbanks in order to ensure sufficient sandbank habitat is represented within the Natura 2000 network of sites for the UK. This is because sandbank habitat in UK waters is located primarily in the southern North Sea and Irish Sea. These sites also ensure representation of the range of sub-types of this habitat within the SAC network. The different sites represent different sub-types of sandbank habitat, from sheltered and estuarine sandbanks, vegetated sandbanks, to different physiographic types associated with headlands, and offshore shelf sandbanks. Each has a different range of sediment types, salinity and exposure to tides and wave action that results in different ranges of associated biological communities.

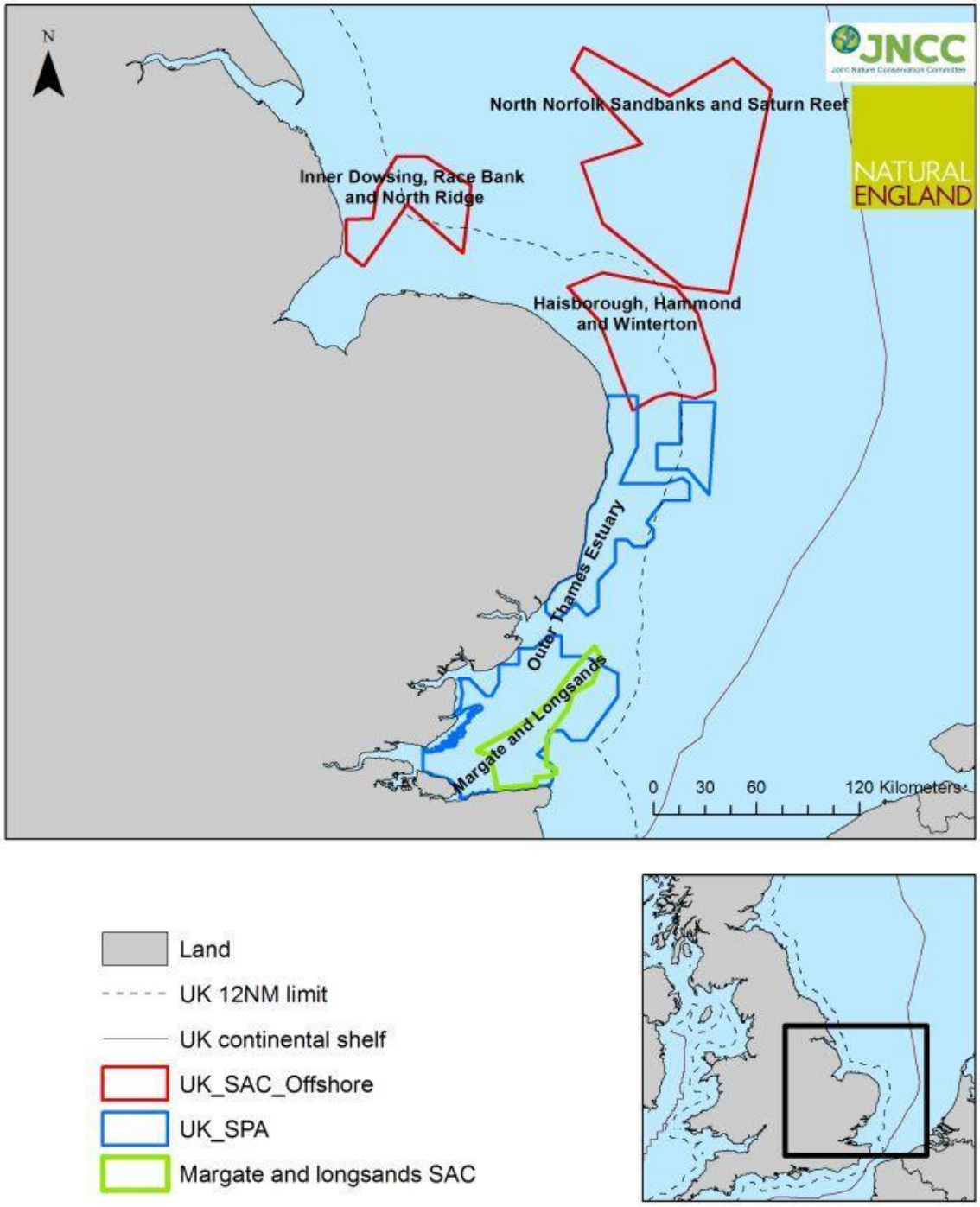
Reef features within these sites consist of areas of biogenic reefs formed by the tube-building ross worm *Sabellaria spinulosa*. The worms need some form of hard substrate to which their tubes will initially be attached, whether bedrock, boulders, artificial substrates, pebbles or shell fragments. However, the presence of extensive reefs in predominantly sediment areas indicates that, once an initial concretion of tubes has formed, additional worms may settle onto the colony. *Sabellaria* reefs may provide a habitat for other associated species to become established (UK Biodiversity Action Plan, 2008). While *S.spinulosa* is naturally common around the British Isles, in most parts of its geographical range it does not form reefs, occurring as solitary individuals or small groups encrusting pebbles, shell, kelp holdfasts and bedrock, or forming thin crusts that may only be seasonal features. A JNCC-organised workshop held in 2007 developed criteria for determining when areas of *S.*

spinulosa meet the definition of ‘reef’. These criteria include elevation, area and patchiness (percentage cover). The outcomes of the workshop are recorded in Gubbay (2007).

Red-throated diver

In the UK, wintering red-throated divers are associated with shallow inshore waters (between 0 – 20m deep and less frequently in depths up to 30m), often occurring within sandy bays, firths and sea lochs, although open coastline is also frequently used (Skov et al. 1995; Stone et al. 1995). In England there are higher concentrations in the Irish and southern North Seas and the easternmost English Channel. They are rarely found inland during the winter. The Great Britain wintering population is estimated to be around 17,000 individuals although the true number of red-throated divers wintering around the UK is likely to be higher (O’Brien et al. 2008). The red-throated diver is considered to be an opportunistic feeder and dietary studies have revealed several different fish species are consumed depending upon the area studied, including members of the cod family, herring, gobies and sand eels (Guse *et al*. 2009 and references therein). The sandbanks of the Outer Thames Estuary overlap with nursery and feeding grounds for many fish species, including the small fish that red-throated divers feed on.

Figure 1. *Southern North Sea SACs and Outer Thames Estuary SPA. Note: as Margate and Long Sands SAC is entirely within 0-12nm, management will be developed in accordance with the inshore SAC management process*.



2. Site overviews

Haisborough, Hammond and Winterton SAC

The Haisborough, Hammond and Winterton site lies off the north-east coast of Norfolk. The central sandbank ridge is composed of alternating ridge headland associated sandbanks in an S-formation (Dyer & Huntley, 1999). The sandy sediments within the site are very mobile in the strong tidal currents. Large scale bank migration or movement appears to be slow, but within the sandbank system there is a level of sediment movement around, and also across, the banks. This is evidenced by megaripple and sandwave formations on the banks. Infaunal communities on the sandy bank tops have low species richness, characterised by mobile polychaetes (catworms) and amphipods (shrimp-like crustaceans) which are able to rapidly re-bury themselves into the dynamic sediment environments. Along the flanks of the banks, and towards the troughs between the banks the sediments tend to be slightly more stable with gravel accumulating in some areas. In these more stable regions of the site, infaunal and epifaunal communities are much more diverse with higher species richness. There are a number of areas (in troughs adjacent to Hammond Knoll and Haisborough Gat) where sediment movements are reduced and these areas support an abundance of attached bryozoans, hydroids and sea anemones. Other tube-building worms such as keel worms and sand mason worms are also found in these areas, along with bivalves and crustaceans. Management measures for *sandbanks slightly covered by seawater at all times* discussed within this document will apply to sandbanks across the whole site beyond the 6 nm fisheries limit.

Sabellaria spinulosa reefs are located at Haisborough Tail, Haisborough Gat and between Winterton Ridge and Hewett Ridge. They arise from the surrounding coarse sandy seabed to heights of between 5cm to 10cm. The reefs are consolidated structures of sand tubes showing seafloor coverage of between 30 per cent, to areas where reef occupies 100 per cent of the sediment. Some parts of the reefs appear to be acting as sediment traps, with exposed tube height accordingly reduced within the core parts of reefs. Typically the reefs support epifaunal species of sponges, hydroids, bryozoans and anemones with mobile predators such as crabs and pink shrimp *Pandalus montagui*. Two areas of *Sabellaria spinulosa* reef within the 12 nautical mile (nm) fisheries limit (the Haisborough Tail and Haisborough Gat reefs) are protected by a byelaw (Marine Management Organisation, 2013a[2]), which prohibits the use of bottom towed gears within these areas. Management measures for *Sabellaria* reef discussed within this document relate only to reef beyond the 12nm limit.

Supporting survey data

Entec UK Ltd (2008a, b) completed an initial appraisal of the occurrence of Annex I sandbank habitat on behalf of Natural England. Data from a variety of sources were examined, including surveys for windfarm developments and aggregate extraction licences, dedicated biodiversity surveys and habitat modelling studies. Further data

[2]The Haisborough, Hammond and Winterton European Marine Site (specified areas) bottom towed fishing gear byelaw (MMO, 2013a)

became available via the SeaZone Digital Survey Bathymetry (DSB) (SeaZone Solutions, 2009b), digitised through funding from the Marine Aggregate Levy Sustainability Fund. Data were also provided by the Aggregates industry (HAML, 2009) and through public consultation on an earlier version of the site Selection Assessment Document before the site was confirmed a cSAC. The DSB data provided good spatial coverage of Haisborough, Hammond and Winterton, with the exception of the north-east corner of the site. In this latter area, supplementary data from the SeaZone coastal Digital Elevation Model were used (SeaZone Solutions Ltd, 2009a). From these datasets, the broad delineation of Annex I sandbank features was undertaken using a slope analysis in GIS.

It is widely recognised that the broad definition of Annex I sandbank habitats makes it difficult to identify a single method that can be used to identify their location and extent, and as such a combination of methods should be used. JNCC adopted a more consistent approach during 2012 to produce a more accurate picture of the extent of all sandbanks in the UK, JNCC analysed bathymetric slope, depth and aspect combined with sediment data, which was an extension of the procedure suggested by Klein (2006) that focused mainly on slope and depth alone (Ellwood, 2014).

Although this modelling approach is widely accepted for delineating sandbanks as topography features at a broad spatial scale, it often misses important areas of sandbank habitat hosting the characteristic biological communities that extend into deeper water, often connecting to the ridges of adjacent sandbanks. Troughs between sandbank ridges contain more stable sediments such as gravels and are generally found to be more biologically diverse. Troughs are thus an integral part of the sandbank feature as a whole, reflected through the conservation objective for the site that sets out to protect both the 'low diversity dynamic sand communities' found on sandbank crests and the 'gravelly muddy sand communities' found across the flanks and troughs of the sandbank feature.

An interdisciplinary field survey aimed at identifying the location, extent and condition of Annex I habitat features in Inner Dowsing, Race Bank and North Ridge (IDRBNR) cSAC, and the Haisborough, Hammond and Winterton (HHW) cSAC was carried out in 2011. Acoustic sidescan and multibeam data were acquired from within both cSACs, together with groundtruthing samples representative of targeted habitat types. Groundtruthing techniques included the acquisition of video and still images of the seabed, and of sediment and faunal samples.

Precise delineation of the entire sandbank feature at both cSACs was not possible due to the chosen survey design based on acoustic data corridors. However, where these corridors did intersect the sandbank features, comparisons between data sets could provide evidence to suggest that the sandbanks are migrating, although the confidence in this evidence is low. .

Analysis of sediment and biological datasets revealed several distinct faunal assemblages; the differences amongst them were likely influenced by localised differences in environmental conditions. At a broad scale, however, differences were most evident between the assemblages present in areas representing reefs and sandbank troughs, and those areas representing sandbank crests and flanks. No

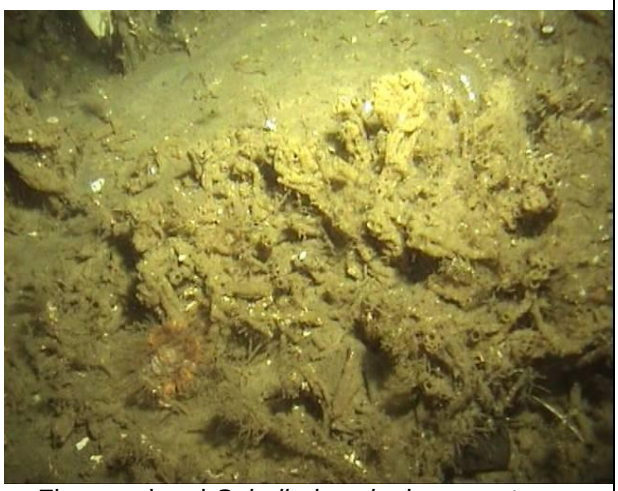
significant differences were observed in the biological composition of individual samples within each of these two groups of habitats.

Biogenic reef structures, built primarily by the tube-dwelling polychaete Sabellaria spinulosa, were observed, sampled and characterised, but due to their very patchy distribution and relatively low elevation, the overall extent of reef habitat could not be measured with any certainty during the 2011 survey of the site.

Following the formal consultation on the original SAC proposal, two datasets on the distribution of *Sabellaria spinulosa* reef were received from the Marine Aggregate Levy Sustainability Fund's East Coast Regional Characterisation (REC) survey (MALSF, 2010) and the Baird gas storage and pipeline environmental characterisation (Gardline Environmental Ltd, 2010). These data included high resolution acoustic data, ground-truthed with drop-down video and still photography. The acoustic data were high resolution multibeam bathymetry and sidescan sonar data for the Baird pipeline corridor and high resolution swathe bathymetry for the REC study. Video images of the seabed were reviewed and assessed for tube height, aggregations, patchiness (percentage cover), extent, and associated fauna. The observations were tested using the reef assessment guidance from JNCC (Gubbay, 2007). Areas identified as reef were cross-referenced with sidescan data, with multibeam bathymetry also viewed in a 3D visualisation software package (Fledermaus). The acoustic signatures of the reef features were assessed, allowing the extents of some reefs to be plotted. It should be noted that the mapped extents of reef are currently restricted by the available acoustic data.

For further detail on the MPA, including links to supporting documents, see http://jncc.defra.gov.uk/page-6534

Medium rippled sand with sand eels *Ammodytes* sp



Fine sand and *Sabellaria spinulosa* crust

Inner Dowsing, Race Bank and North Ridge SAC

The Inner Dowsing, Race Bank and North Ridge site is located off the south Lincolnshire coast in the vicinity of Skegness, extending eastwards and north from Burnham Flats on the North Norfolk coast, occupying The Wash Approaches. Water depths are generally shallow and mostly less than 30m below chart datum (BCD). The area encompasses a wide range of sandbank types (banks bordering channels,

linear relict banks, sinusoidal banks with distinctive 'comb-like' subsidiary banks).

This group of banks within the Wash Approaches are generally between 15 to 20km long ridges, 1.5 to 3km wide and with crest heights at generally less than 5m BCD. The sedimentary component of the banks is fine to medium sands, predominantly being derived from coastal erosional processes over the last 5,000 years after the last glacial retreat and marine inundation (Cooper et al. 2008).

Inner Dowsing to the west of the site is a single large sandbank, comprising coarse sand with some areas of gravel. The tidal currents in the area maintain the feature and probably shape the veneer of bedforms in the overfalls at the northern end of Inner Dowsing. The Race Bank/North Ridge/Dudgeon Shoal sandbank system is a good example of a sinusoidal sandbank system that also has a complex pattern of smaller sandbanks associated with it. These smaller banks form a unique 'comb-like' pattern running east from the main line of the sandbank ridges. The tops of the sandbanks are characterised by communities with low species richness dominated by polychaete worms and mobile amphipod crustaceans.

The areas between these main sandbanks are composed of mixed sand and gravelly sands, predominantly as veneers over glacial tills (Cooper et al. 2008). In these areas a mosaic of biotopes occur with varying species richness largely dominated by the ascidian *Molgula* sp. along with a number of nemertean worms and polychaetes

Abundant agglomerations of *Sabellaria spinulosa* have been consistently recorded within the site boundary (Foster-Smith & Hendrick, 2003). Survey data indicate that reef structures are concentrated in certain areas of the site, with a patchy distribution of crust-forming aggregations across the site. The main areas of *S. spinulosa* reef are found along the Lincolnshire coast south of Skegness at Lynn Knock and Skegness Middle Ground (south-west part of the site); just north of Docking Shoal bank; and associated with the southern edge of Silver Pit (in the northern area of the site) (Woo, 2008; Foster-Smith & Hendrick, 2003; Brutto, 2009; Limpenny et al. 2010). More recent survey data from Cefas (Curtis, Rance & Frojan, 2014) and EIFCA has enabled the delineation of more extensive reef within the site and also identified further areas which are likely to support reef. These areas are almost exclusively within the 6nm limit

Typically, in the environs of The Wash and its approaches, areas of high *S. spinulosa* density support attached epifaunal communities composed of bryozoans, hydroids, sponges and anemones. Additional fauna within the area includes polychaetes, squat lobsters, crabs, the common lobster and the commercially exploitable pink shrimp. Reefs formed by *S. spinulosa* allow colonisation by other species not normally associated with the adjacent sediment habitats.

Three areas of *Sabellaria* reef within the 12nm fisheries limit are protected by a byelaw (Marine Management Organisation, 2013b[3]), which prohibits the use of bottom towed gears within these areas. Management measures for *Sabellaria* reef

[3] The Inner Dowsing, Race Bank and North Ridge European Marine Site (specified areas) bottom towed fishing gear byelaw (MMO, 2013b)

discussed within this document relate only to the Silver Pit South reef, located beyond the 12nm limit.

Supporting survey data

Entec UK Ltd (2008a, b) completed an initial appraisal of the occurrence of Annex I sandbank habitat on behalf of Natural England. Data from a variety of sources were examined, including surveys for windfarm developments and aggregate extraction licences, dedicated biodiversity surveys and habitat modelling studies. Further data became available via the SeaZone Digital Survey Bathymetry (DSB) (SeaZone Solutions, 2009b), digitised through funding from the Marine Aggregate Levy Sustainability Fund. Data were also provided by the aggregates industry (HAML, 2009) and through the original consultation on the site prior to it becoming a cSAC. The DSB data provided good spatial coverage of Inner Dowsing, Race Bank and North Ridge cSAC with the exclusion of the western part of the site in the vicinity of the north end of Inner Dowsing bank and the Dowsing Overfalls. In this latter area, supplementary data provided from the SeaZone coastal Digital Elevation Model (DEM) was used (SeaZone Solutions Ltd, 2009a).

From both the DSM and DEM datasets, sandbank ridges were delineated using a slope analysis in GIS. This analysis provided an indicative map of sandbank ridge locations but did not delineate the complete extent of Annex I sandbank within the site since information on the biological communities present in adjacent sediment habitats was not factored into the analysis. Sandbank troughs that are integral to the Annex I sandbank feature, and areas of supporting habitat that are considered critical to the integrity of the sandbanks in the site, were not assessed.

The sandbank ridges were cross-referenced with sediment data to confirm that identified features consisted of sandy sediments, as defined in the Annex I sandbank definition (European Union, 2007). Sub-bottom profile data was also reviewed and analysed to assess sandbank internal structure and assist with delineating the extent of these ridges.

Recent biological data was reviewed from several sources to validate both the assemblages and communities associated with the sandbanks, and those not considered part of the designated features (Amec, 2007; Brutto, 2009; Centrica, 2007, 2008, 2009a, 2009b; EMU, 2005a, b; MALSF, 2010; MES, 2003). This process assisted in assessing the biological component of the sandbanks, thereby refining the feature delineation derived from geological and geomorphological assessments.

An interdisciplinary field survey aimed at identifying the location, extent and condition of Annex I habitat features in Inner Dowsing, Race Bank and North Ridge (IDRBNR) cSAC, and the Haisborough, Hammond and Winterton (HHW) cSAC was carried out in 2011. Acoustic sidescan and multibeam data were acquired from within both cSACs, together with groundtruthing samples representative of targeted habitat types. Groundtruthing techniques included the acquisition of video and still images of the seabed, and of sediment and faunal samples. It is important to note that the delineation of the entire sandbank feature within the cSACs was not possible due to the survey design that was based on acoustic data corridors.

It is widely recognised that the broad definition of Annex I sandbank habitats makes it difficult to identify a single method that can be used to identify their location and extent, and as such a combination of methods should be used. JNCC adopted a more consistent approach during 2012 to produce a more accurate picture of the extent of all sandbanks in the UK, JNCC analysed bathymetric slope, depth and aspect combined with sediment data, which was an extension of the procedure suggested by Klein (2006) that focused mainly on slope and depth alone (Ellwood, 2014).

Although this modelling approach is widely accepted for delineating sandbanks as topography features at a broad spatial scale, it often misses important areas of sandbank habitat hosting the characteristic biological communities that extend into deeper water, often connecting to the ridges of adjacent sandbanks. Troughs between sandbank ridges contain more stable sediments such as gravels and are generally found to be more biologically diverse. Troughs are thus an integral part of the sandbank feature as a whole, reflected through the conservation objective for the site that sets out to protect both the 'dynamic sand communities' found on sandbank crests and the 'gravelly muddy sand communities' found in the troughs of the sandbank feature.

Biogenic reef structures, built primarily by the tube-dwelling polychaete Sabellaria spinulosa, were observed, sampled and characterised, but due to their very patchy distribution and relatively low elevation, the overall extent of reef habitat could not be measured with any certainty (Froján et al. 2013, *in press*).

The main areas of Annex I reef habitat are found along the Lincolnshire coast south of Skegness at Lynn Knock; the Docking Shoal reef just north of Docking Shoal and Burnham Shoal; and Silver Pit South reef associated with the southern edge of Silver Pit. Acoustic data was used to map the reef extent for the Lynn Knock and Silver Pit South Reefs. Point data was used to indicate the location of the Docking shoal reef as spatial extent data was not available. Videos were reviewed and assessed for tube height, aggregations, patchiness (percentage cover), extent, and associated fauna. The observations were tested using the reef assessment guidance from JNCC (Gubbay, 2007). It should be noted that the mapped extents of the reef are currently restricted by the available acoustic data.

The interdisciplinary survey in 2011 identified two areas of potential *Sabellaria spinulosa* reef south-east of the Silver Pit South Reef and west of North Ridge using ground-truthing data (from grab samples and video tows). However, the precise detection, delineation and calculation of areal extent of biogenic reef were not possible using the acquired acoustic datasets and calculating an overall reefiness score was not attempted for these locations.

For further detail on the MPA, including links to supporting documents, see http://jncc.defra.gov.uk/page-6536

Gravelly sandwaves (from Limpenny et al. 2010)

Sabellaria spinulosa reef (from Limpenny et al. 2010)

North Norfolk Sandbanks and Saturn Reef SAC

The North Norfolk Sandbanks are the most extensive example of the offshore linear ridge sandbank type in UK waters (Graham et al. 2001). They are subject to a range of current strengths which are strongest on the banks closest to shore and which reduce offshore (Collins et al. 1995). The outer banks are the best example of open sea, tidal sandbanks in a moderate current strength in UK waters. Sandwaves are present, being best developed on the inner banks; the outer banks having small or no sandwaves associated with them (Collins et al. 1995). The banks support communities of invertebrates which are typical of sandy sediments in the southern North Sea such as polychaete worms, isopods, crabs and starfish.

The banks have a north-west to south-east orientation and are thought to be progressively, though very slowly, elongating in a north-easterly direction (perpendicular to their long axes) (Cooper et al. 2008). They extend from about 40km (22 nautical miles) off the north-east coast of Norfolk out to approximately 110km (60nm) (Collins et al. 1995). The summits of the banks are in water shallower than 20m below Chart Datum, and the flanks of the banks extend into waters up to 40 m deep.

The Saturn *Sabellaria spinulosa* reef, first discovered in 2002, consisted of thousands of fragile sand-tubes made by ross worms which have consolidated together to create a solid reef structure rising above the seabed. More recent surveys have not found extensive reef structures in the same location. Although there is no evidence to show what caused the change in reef distribution the site clearly provides favourable conditions for *Sabellaria* reef formation thus there may be a possibility to facilitate recolonisation/recovery of reef structures. Newer data, from a survey carried out in 2013, will provide updated evidence of observed *Sabellaria* reef extent within areas of the site recently surveyed.

Supporting survey data

Scientific information on the sandbanks comes from the DTI (SEA 2) survey (Hartley Anderson Ltd, 2001), the EC Biodiversity Survey (Zuhlke, 2000) and the UKOOA

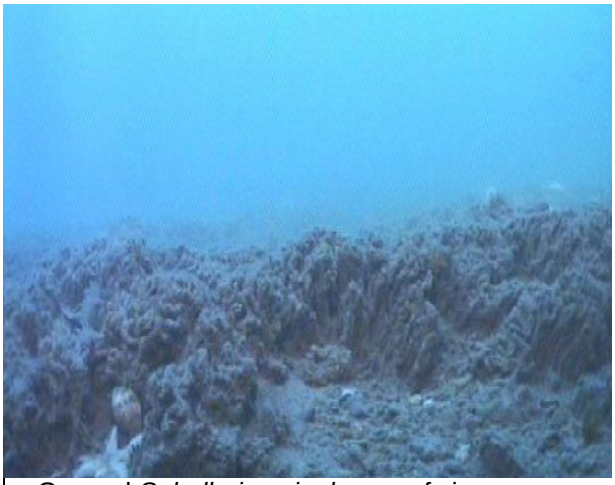
dataset of environmental surveys (UK Benthos, 2001). Part of the site area was also surveyed by Entec/Envision on behalf of Natural England, as part of their Outer Wash Sandbank survey (Natural England, 2008).

In 2013, JNCC produced a map showing the UK resource of the Annex I feature '*Sandbanks which are slightly covered by sea water all the time,*' that was developed using a spatial modelling approach which applied a series of criteria to physical environmental data (Ellwood, 2014). In trying to separate banks according to the broad definition of the feature provided by the European Commission, these criteria considered both the slope and depth of the seabed, and the modelled map was prepared specifically for assessment and reporting purposes.

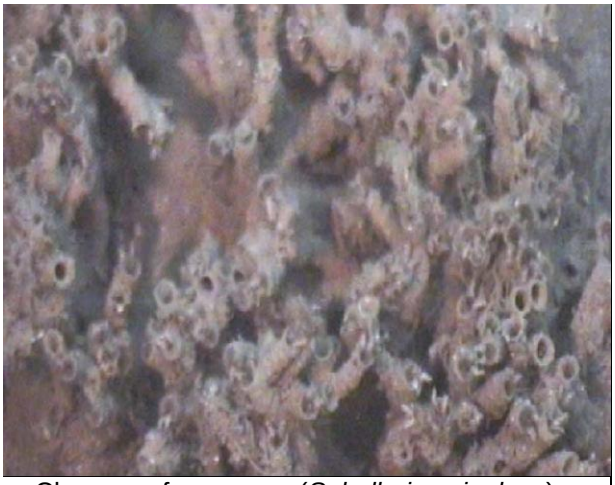
JNCC undertook a survey at North Norfolk Sandbanks and Saturn Reef with Cefas between 4th November and 25th November 2013 on the RV Cefas Endeavour (Survey CEND22/13 and CEND23/13). JNCC have since undertaken further analysis of the biological communities present across the site, using data collected on the 2013 survey. As a result, JNCC conclude that the biological communities associated with the individual modelled banks occur across the MPA, including adjacent sandy areas where the seabed is much deeper. Sand is the dominant sediment type across the MPA, with patches of coarser and mixed sediment, which may then also be associated in places with *Sabellaria spinulosa* reef. These results confirm JNCC's earlier view set out in the SAC Selection Assessment Document, that the whole MPA should be considered as a representative functioning example of the Annex I sandbank feature.

The area of Saturn biogenic reef was originally discovered during a proposed North Sea pipeline route survey in 2002. In 2003, ConocoPhillips commissioned Subsea 7 to undertake a visual Remote Operated Vehicle survey of the areas to determine the identity and extent of these tubeworms (BMT Cordah, 2003). Video and photographic images taken during this survey clearly demonstrated the presence of *Sabellaria spinulosa* reef and its associated fauna. However, further surveys undertaken by Cefas in July 2006 failed to identify reef feature within this area, although the site clearly provides favourable conditions for *Sabellaria* reef formation. On the 2013 JNCC/ Cefas survey, *Sabellaria spinulosa* reef was recorded at a number of locations within the MPA, and preliminary results from this study will be available at the stakeholder workshop.

For further detail on the MPA, including links to supporting documents, see http://jncc.defra.gov.uk/page-6537



General *Sabellaria spinulosa* reef view showing profile and extent (BMT Cordah, 2003)



Close up of ross wom (*Sabellaria spinulosa*) aggregations showing tubes built from sand (BMT Cordah, 2003)

Margate and Long Sands SAC

As of 2014 Margate and Long Sands SAC is entirely within 0-12nm and thus it falls under the inshore management process. The UK 12 nm territorial limit baseline was updated by the United Kingdom Hydrographic Office (UKHO) in 2014 which is why this site has moved from the offshore process to the inshore As this site was discussed previously as part of the offshore process and, as there are still historic access rights for both Belgian and French fleets, information is provided here for context.

The Margate and Long Sands site starts to the north of the Thanet coast of Kent and extends in a north-easterly direction to the outer reaches of the Thames estuary. It contains a number of Annex I sandbanks which are slightly covered by sea water at all times, the largest of which is Long Sands itself. The sandbanks are composed of well-sorted sandy sediments, with muddier and more gravelly sediments in the troughs between banks. The upper crests of some of the larger banks dry out at low tide. The banks are tidally influenced estuary mouth sandbanks and, in common with all sandbanks, the structure of the banks is dynamic, with significant movements of the bank edges over time.

The fauna of the bank crests is characteristic of species-poor, mobile sand environments, and is dominated by polychaete worms and amphipods. Within the troughs and on the bank slopes, a higher diversity of polychaetes, crustacea, molluscs and echinoderms are found. Mobile epifaunal includes crabs and brown shrimp, along with squid and commercially important fish species such as sole and herring. There is a significant amount of the reef-forming ross worm (*Sabellaria spinulosa*) at the site, which, when formed as reef, qualifies as an Annex I habitat. However, the available data indicate that the distribution of *S. spinulosa* is patchy, or that the aggregations form crusts rather than reefs. Areas of high *S. spinulosa* density support a diverse attached epifauna of bryozoans, hydroids, sponges and tunicates, with additional fauna including polychaetes, bivalves, amphipods, crabs and lobsters. These diverse communities are usually found on the flanks of the sandbanks and towards the troughs.

Supporting survey data

Entec UK Ltd (2008a, b) completed an initial appraisal of the occurrence of Annex I sandbank habitat on behalf of Natural England. Data from a variety of sources was examined, including windfarm and aggregate surveys, dedicated surveys and modelling. Further data became available via the SeaZone Digital Survey Bathymetry (DSB) (SeaZone Solutions, 2009b), digitised through funding from the Marine Aggregate Levy Sustainability Fund (MALSF) Regional Environmental Characterisation (REC) studies (SeaZone Solutions Ltd, 2009). Other new sources of information included surveys from aggregate license areas. The DSB datasets from SeaZone provided good spatial coverage of Margate and Long Sands cSAC. From this data, a more accurate delineation of Annex I sandbank features was made possible using a slope analysis in GIS. Guidance by Klein (2006) on delineating sandbanks was followed (the 'Klein methodology' was also used by Germany and the JNCC to identify sandbank in the Dogger Bank). This involved using a slope angle of 0.5° for delineating the edges of the bank features. The main bank structures themselves were easily identifiable by viewing the 1° slope layer alongside the 0.5° slope layer. Sandbank features were cross-referenced with sediment data to confirm that identified features consisted of sandy sediments, as defined in the Annex I sandbank definition (European Union, 2007).

In order to produce a more accurate picture of the extent of all sandbanks in the UK, a more consistent approach was adopted by JNCC. It was recognised that the broad definition of Annex I sandbank habitats makes it difficult to identify a single method that can be used to identify their location and extent, and as such a combination of methods should be used. During 2012 JNCC began the analysis of bathymetric slope, depth and aspect combined with sediment data, extending the procedure of Klein (2006), which focused mainly on slope and depth alone (Ellwood, 2014).

See the Margate and Long Sands SAC Selection Assessment Document (version 2.5, Natural England, 2010c) for a more detailed site overview and further information on data sources, sediment conditions and bathymetry, and benthic invertebrate communities.

Outer Thames Estuary SPA

The Thames Estuary is located in the southern part of the North Sea on the east coast of England, between the counties of Essex (on the north side) and Kent (on the south) and extends as a broad opening into the North Sea. The SPA boundary extends from a central point mid-river just east of Southend on the Essex side and on the Kent side from a point just east of Sheerness to approximately just east of Herne Bay. To the north of this area two separate parts of the site extend southwards along the coasts of east Norfolk and Suffolk and offshore from the Lowestoft area. The seaward boundary of the SPA lies partly within the 20m depth contour and marginally (along the outer eastern edge) within the 20-50 m depth contour.

Wintering red-throated divers occur throughout the Outer Thames SPA in numbers of national importance (6,466 individuals, 38% of the GB population, 1989 –

2006/07). Red-throated divers are known to be associated with sandbank features, although the exact use of different habitats within the Outer Thames Estuary is complex, and related to both physical and hydrographic variables (Skov et al. 2011).

The SPA consists of areas of shallow and deeper water, high tidal current streams and a range of mobile sediments. Large areas of mud, silt and gravelly sediments form the deeper water channels, the main ones of which form the approach route to the ports of London and as such are continually disturbed by shipping and maintenance dredging. Sand in the form of sandbanks separated by troughs predominates in the remaining areas and the crests of some of the banks are exposed at mean low water. In the northern part of the site the main sandbanks are (north to south) Middle Cross Sand, Scroby Sands, Helm Sand, Newcombe Sand, Aldeburgh Napes, Aldeburgh Ridge, North Ship Head and Bawdsey Bank; in the southern part of the site the main sandbanks are Red Sand, Kentish Flats, West and East Barrow, Sunk Sand, Shingles, Long Sand, Margate Sand and Kentish Knock.

The seabed in the area of the Norfolk and Suffolk coast is of a similar composition to that in the main estuary with large shallow areas of mud, sand, silt and gravely sediments but, in the absence of main port areas within this area, there is consequently less disturbance through shipping or dredging.

The red-throated diver is considered to be an opportunistic feeder and dietary studies have revealed several different fish species are consumed depending upon the area studied, including members of the cod family, herring, gobies and sand eels (Guse et al. 2009 and references therein). The sandbanks of the Outer Thames Estuary support nursery and feeding grounds for many fish species, including the small fish that red-throated divers feed on, such as herring, sprat, gobies, sand eels and various flat fish.

Supporting survey data

Aerial survey data collected using standard methods by the Nature Conservancy Council, JNCC, Wildfowl and Wetlands Trust and the Natural Environmental Research Institute in the Greater Thames were analysed in order to assess whether the site qualified as an SPA, using guidelines for selecting sites for inshore waterbird aggregations (Webb & Reid, 2004).

The boundary for red-throated diver within the Outer Thames SPA is based on identifying a density threshold using data from 37 days of survey over the Greater Thames, between January 1989 and March 2005, analysed by Webb et al. (2005). Additional aerial surveys were carried out during the winters of 2005/06 and 2006/07, covering previously surveyed areas and new areas, beyond the possible SPA seaward boundary. APEM Remote Sensing carried out two high resolution digital aerial surveys of the Outer Thames SPA during January and February 2013, in order to provide an up to date population estimate for red-throated divers. Using model-based calculations, red-throated divers peaked in February 2013 at an estimated 13,605 (12,712 – 14,489) individuals. Red-throated diver distributions in the SPA appeared to be related to various environmental variables including bathymetry, chlorophyll a, wave base, tidal base, aspect and slope of the seabed, average sea surface temperature, distance from dredging operations and distance to coastline. Distributions of red-throated divers may also have been affected by shipping activity

and the presence of operational and in-construction wind farms (APEM 2013). However, as results were based on modelled results from only two months of survey data, Natural England are now working with DONG Energy to extrapolate their three year post-construction monitoring dataset to establish whether birds have habituated to the presence of windfarms.

See the Departmental Brief for the Outer Thames Estuary (Natural England & JNCC, 2010) for further information on the site and the methodology applied to set the boundary.

Red-throated diver winter plumage (Annette Cutts)

3. Conservation objectives

Conservation objectives for each of the sites are shown in Table 1 below. Conservation objectives set out the desired quality of the protected features within each Special Area of Conservation/Special Protection Area. They are a set of site specific objectives to be met in order for the features in a site to maximise their contribution to the UK resource of Annex I habitat and Annex II species features achieving Favourable Conservation Status under the EU Habitats Directive (and equivalent under the Birds Directive). Favourable condition relates to the maintenance of the structure, function and typical species for that habitat feature within the site.

The conservation objectives for each feature are set subject to natural change. Natural change refers to changes in the environment which are not a result of human influences. Some human influence on an interest feature is acceptable if it can be proved to be/can be established to be compatible with the achievement of the conditions set out under the definition of favourable condition for each interest

feature. A failure to meet these conditions which is entirely a result of natural process will not constitute unfavourable condition, but may trigger a review of the definition of favourable condition.

Table 1. *Southern North Sea SAC conservation objectives for sandbanks which are slightly covered by seawater all the time and reefs*

	Annex I feature	
Site	**Sandbanks which are slightly covered by seawater all the time**	**Reefs**
Haisborough, Hammond and Winterton SAC	Maintain in favourable condition, in particular the sub-features gravelly muddy sand communities and dynamic sand communities (version 6, JNCC, 2013a)	Maintain or restore in favourable condition (version 6, JNCC, 2013a)
Inner Dowsing, Race Bank and North Ridge SAC	Maintain or restore in favourable condition, in particular the sub-features gravelly muddy sand communities and dynamic sand communities (version 4, JNCC, 2013b)	Maintain or restore in favourable condition (version 4, JNCC, 2013b)
North Norfolk Sandbanks and Saturn Reef SAC	Restore to favourable condition (version 6, JNCC, 2012)	Restore to favourable condition (version 6, JNCC, 2012)
Margate and Long Sands SAC	Maintain in favourable condition, in particular the sub-features gravelly muddy sand communities and dynamic sand communities (version 6, Natural England, 2012)	Not applicable

	Annex I species	
Site	**Red-throated diver**	
Outer Thames Estuary SPA	Maintain or enhance the red-throated diver population and its supporting habitats.	

4. Roles

The role of JNCC is to advise UK Government on management options for areas of these SACs beyond the 12nm limit. In doing this, our aim is to ensure the conservation objectives for the protected features are met. Fisheries management in this offshore area is an exclusive competence of the EU and in areas outside the UK's 12 nautical mile limit, management measures can only be implemented through the provisions of the Common Fisheries Policy (CFP). In areas within the 12 nautical mile fisheries limit a different set of procedures for the introduction of management measures apply. Due to the cross-boundary nature of three of these sites, Natural England and JNCC will work together, with JNCC leading on the production of fisheries management options papers.

The Department for Environment, Food and Rural Affairs (Defra), with assistance from the Marine Management Organisation (MMO), will lead discussions on management with stakeholders. They will consider JNCC and Natural England's advice and will lead on the development of specific management measures. Defra will be responsible for making recommendations to Ministers on these measures and drafting the fisheries management request to the European Commission with assistance from the MMO.

Stakeholders can provide additional evidence to support the development of management options, including local knowledge of the environment and activities. This will help in the development of well-designed and effective management measures to ensure the features meet their conservation objectives.

5. Effects of fishing on the features

Sandbanks which are slightly covered by seawater all the time

Whilst it is unlikely that **mobile bottom contact gear** can affect the long-term natural distribution of sandbanks, there is evidence to indicate that the use of bottom contacting mobile gears can impact the structure and function of the habitat and the long term survival of its associated species.

The extent to which mobile gear impacts on sand and gravel communities can vary considerably, according to the type of gear, the intensity of fishing and the sediment

composition. Trawling and dredging tend to cause increased mortality of fragile and long lived species and favour opportunistic, disturbance-tolerant species (Bergman & Van Santbrink, 2000; Eleftheriou & Robertson, 1992). Some particularly sensitive species may disappear entirely (Bergman & Van Santbrink, 2000). The net result is benthic communities modified to varying degrees relative to the un-impacted state (Bergman & Van Santbrink, 2000; Kaiser et al. 2006).

In higher energy locations, for example the sandy bank tops or wave and/or tide exposed areas the associated fauna tend to be well adapted to disturbance and as a result are more tolerant of fishing-related disturbance (Dernie et al. 2003; Hiddink et al. 2006). The habitat may be maintained in a modified state; however modification is likely to be low relative to natural variation. In lower energy locations, such as muddy sands and sand in deep water, or on the flanks and towards troughs between banks, sediments tend to be more stable and their associated fauna less tolerant of disturbance (Kaiser et al. 2006; Hiddink et al. 2006). The habitat may be maintained in a modified state with reduced abundance of fragile, long lived species.

It is unlikely that **demersal static gears** will have a significant effect on the long-term natural distribution of sandbanks, or on the structure and function of their associated biological communities.

Reefs

Demersal towed gears have the potential to effect the long term natural distribution of the *Sabellaria spinulosa* reefs and the structure and function of their associated biological communities. Loss of *Sabellaria spinulosa* reefs in the North East Atlantic has been attributed to the long-term effects of various fishing practices, predominantly that of towed demersal gear as in Morecambe Bay (Jones et al, 2000; Holt at al. 1998). Trawls break apart *S. spinulosa* tubes, resulting in direct mortality of the worms and a reduction of the structure and complexity of the habitat, which may no longer support associated animals and plants (UK Biodiversity Action Plan, 2000).

One study (Vorberg, 2000) conducted off the coast of France and in the Wadden Sea challenges the view that all towed gears constitute a great risk to all Sabellaria reef; however, the study findings relate exclusively to short-term effects following once-only disturbance. The gear is likely to be different to that used in the UK, and reef characteristics are also likely to differ; therefore this study is not considered sufficient to alter previous assessments made for UK waters (OSPAR, 2010; Hall et al, 1998; Tillin et al. 2010).

It is unlikely that **demersal static gears** at moderate levels of fishing effort will have a significant effect on the long-term natural distribution of *Sabellaria* reefs, or on the structure and function of their associated biological communities. Sensitivity of *Sabellaria* reefs to static gears is low to medium depending on fishing intensity (Hall et al. 2008; Tillin et al. 2010). However, effects at high levels of fishing intensity are uncertain and it is possible in some circumstances that damage to reef structures could exceed their capacity to recover.

Red-throated divers

Fisheries have the ability to effect populations of red-throated divers through direct mortality, disturbance and deterioration of their habitats. The significance of these effects will vary according to the nature of the fishery.

Studies have shown entanglement in various types of static fishing gear, netting and marine litter as one of the most frequently identified causes of red-throated diver mortality in NW European and GB waters (Okill, 2002; Ermann et al. 2005). However, no evidence of entanglement was seen over two winters of observations during a study by Natural England and the Kent and Essex Inshore Fisheries Conservation Authority (IFCA). This may be due to the sample size; the smaller numbers of fishermen operating in the SPA; shorter permitted soak times; and the fact that boats remain with the drift nets, potentially disturbing the red-throated divers and creating a deterrent for their return (Knollys & Laverick, 2012; Laverick, 2014). Netting is widespread across the sandbanks in the Outer Thames Estuary SPA; however this is seasonally focused and occurs primarily at times of year outwith the period when the red-throated diver population is at its peak.

Red-throated divers are highly sensitive to non-physical disturbance by noise and visual presence during the winter (Garthe & Huppop 2004). They can be disturbed by wind turbine rotors, boat movements, and general activity. Disturbance can cause birds to reduce or cease feeding in a given area or to fly away from an area (i.e. be displaced).

In general, benthic sandbank communities are relatively resilient to physical damage. However, repeated impacts on the habitats (through changes in suspended sediment or physical disturbance caused by selective extraction, anchoring or bottom-towed fishing gear) could adversely affect the ability of the habitats to recover, leading to permanent change and ultimately to the possible loss of prey species. This may result in a reduction in the value of sandbank habitats as foraging sites for the overwintering population of red-throated diver.

Commercial extraction of the red-throated divers' main fish prey species, as target and/or bycatch species, has the potential to impact the birds, but the extent of this in the Outer Thames Estuary SPA is not well understood.

6. Development of management options

A range of options are available to managers, which differ in the degree of restriction they would place on fishing operations and the risk they would pose to the achievement of the conservation objectives. Three broad categories of possible management are considered below and further elaborated in Tables 4 to 6.

For each of these broad management categories, we have evaluated the level of risk posed to the achievement conservation objectives. It is not generally possible to quantify the degree of risk posed by each management option, however we have indicated in Tables 4 to 6 where we consider that a risk exists, where it would be

'significant', and where it would be reduced by application of management. In most cases we have not recommended a single preferred option but would advise that fisheries managers and stakeholders consider the identified levels of risk when further developing management options.

Risks were evaluated using existing data and information on protected features and relevant activities, and also our understanding of the relationships between the feature and relevant activities. Our identification of the risk has been refined using available information on the interaction between the features and activities where this is available (see section 5). The text focuses on interactions in terms of physical overlap but the assessment of risk in future should also take account of the intensity and frequency of activities within the SAC.

A gradient of management options has been considered. These have been described under three potential management option categories:

a) **No additional management** - where fisheries managers choose to apply no additional site specific fisheries management within the site

b) **Additional management to reduce pressures** – where fisheries managers may wish to consider a range of measures that could be used to reduce the risk to features by managing fishing activity. These could include**:**

   - Area restrictions (permanently closing some or all of the feature's area)
   - Gear restrictions (e.g. restricting use of the more damaging gears)

   Ideally, any measures would generally apply only to the parts of the sites where the feature is present. However, there may be some circumstances in which it could be desirable to extend management measures beyond the known area of feature distribution, for example, where conditions are suitable for a feature to exist but there are insufficient data to confirm its presence.

   In situations where there is high uncertainty regarding the impacts of fishing on the features, these management measures could be "adaptive" ie changes in the features' condition following introduction of managing measures will be monitored and future management may be modified accordingly.

c) **Additional management to remove pressures** – where fishing activities known to adversely affect the feature would be excluded. Such exclusion would generally apply only to the parts of the sites where the feature is present, although it may occasionally be necessary to apply them to a wider area.

We recognise that stakeholders can provide local environmental knowledge and more detailed information on activities, including distribution and intensity of effort, frequency of activity, and fishing methods employed. This additional information will help us to develop more specific management options, focused on interactions between features and activities

7. Overview of fishing activities

See Annex One for maps showing fishing activity over the sites and Table 2 for a list of the >15m vessel activities currently (2009-2013) occurring within each site.

Vessel Monitoring System data for the 3 northern most sites (North Norfolk Sand banks and Saturn Reef, Inner Dowsing, Race Bank and North Ridge and Haisborough, Hammond and Winterton) show relatively low UK fishing effort for larger vessels (> 15 m) over the 4 years analysed (2009-2013) (see figures 2 to 4).

By contrast, the data indicate widespread non-UK fishing vessel activity (figures 5 to 7); though it is not possible to link this to logbook returns as those data are not available to JNCC. Fishing gear type assigned for non UK vessels was obtained from the EU fishing vessel register, and has less confidence than gear types identified through VMS-logbook linkage since vessels are free to use gears other than those listed in the EU register.

Beam trawling is the most widespread fishing activity in the region (figures 2 and 5), with a lesser amount of demersal otter trawling activity (figures 3 and 6). Vessels flagged to The Netherlands and Belgium undertake most of the activity, with some French and German vessels also operating in the region.

VMS data for Margate and Long Sands SAC and Outer Thames SPA suggest UK fishing activity by vessels working beam trawl and demersal otter trawl (figures 2 and 3). There are infrequent reports of mechanised dredges although due to inconsistencies in the coding for dredge fisheries, there is a possibility that this may actually be miscoded towed boat dredge fishery. Non-UK VMS data linked to the EU vessel register indicates that there has been relatively low effort within the site over the 4 year period analysed (2009-2013), mostly concentrated in the North and east of the site. As with the other sites, beam trawling was the main activity from non-UK registered vessels, principally from the Netherlands, Belgium and Germany. Some demersal otter trawling activity was also noted within the site from Belgian and French vessels.

Table 2. *Overview of existing >15m fishing activity believed to take place within or close to the Southern North Sea SACs*

Site	**Fishing activities considered capable of affecting the integrity of the sites**	**Fishing activities *not* considered capable of affecting the integrity of the sites**
Haisborough, Hammond and Winterton SAC	• Beam trawl • Demersal otter trawl	• Pelagic otter trawl
Inner Dowsing, Race Bank and North Ridge	• Beam trawl Demersal otter trawl	• Gill nets • Pelagic otter trawl • Pots and traps

North Norfolk Sandbanks and Saturn Reef SAC	• Beam trawl • Demersal otter trawl	• Pelagic otter trawl • Pelagic pair trawl
Margate and Long Sands SAC	• Beam trawl • Demersal otter trawl • Mechanised dredges	
Outer Thames SPA	• Beam trawl • Demersal otter trawl • Mechanised dredges • Towed dredges • Pots and traps • Longlines • Pelagic pair trawl • Pelagic trawl	

Additional information on the inshore fishing fleet (including vessels under 15m in length) was available from the Cefas National Inshore Fisheries Data Layers, produced under contract to Defra (Vanstaen & Silva, 2010). This project brought together sightings and boardings data from Sea Fisheries Committees of England and Wales and sightings data available from the MMO. The data indicates relatively low fishing effort of <15m vessels across the sites, with the exception of the Southern component of the Outer Thames Estuary SPA, although it is recognised that there are data limitations and that fishing activity is likely to be under-represented (figure 8 should be viewed in the context of the data confidence layer included).

Table 3 shows information on gear types in use within the sites, provided by the University of St Andrews as part of a sampling programme focused on static nets (S. Northridge, pers. comm.).

Table 3. *Overview of existing <15m fishing activity believed to take place within the Southern North Sea SACs*

Site	**Fishing activities considered capable of affecting the integrity of the sites**	**Fishing activities *not* considered capable of affecting the integrity of the sites**
Haisborough, Hammond and Winterton SAC		• Gill nets • Trammel nets • Drift trammel nets
Inner Dowsing, Race Bank and North Ridge		• Gill nets

North Norfolk Sandbanks and Saturn Reef SAC		• Gill nets
Margate and Long Sands SAC		• Drift nets • Gill nets • Drift trammel nets • Ring nets • Tangle nets • Trammel nets
Outer Thames SPA	• Drift nets • Drift trammel nets • Gill nets • Mid-water pair trawls • Ring nets • Tangle nets • Trammel nets	

8. Management options

a. for sandbank and reef features

Table 4. *Management options for mobile bottom contact gear*

Management option	Risk to achieving the conservation objectives	Site specific comments
Option 1: No additional management	This option would pose a risk of not achieving the conservation objectives for **sandbanks which are slightly covered by sea water all the time**. The conservation objective for **reefs** would not be met under this management option.	
Option 2: Reduce/limit pressures	This option would reduce the risk of not achieving the conservation objectives for the **reef** and **sandbanks which are slightly covered by sea water all the time**. Appropriate management of **reef**	**Haisborough, Hammond and Winterton:** Two areas of *Sabellaria* reef within 12nm (Haisborough Tail Reef and Haisborough Gat Reef) are already subject to a byelaw[4] under the Marine and Coastal Access

[4] The Haisborough, Hammond and Winterton European Marine Site (specified areas) bottom towed fishing gear byelaw (MMO, 2013a)

	could include closure of the known extent of the feature within the sites. Areas to be covered by management restrictions would include a buffer zone around the known features to reduce any risk of accidental contact with the feature. However, given the incomplete survey coverage of the site, a risk of impact to patches of feature not identified during survey would remain. The risk could be further reduced by restricting access to areas which clearly provide favourable conditions for reef development, based on past presence of reef structures and knowledge of reef ecology. The location of areas to be covered by management restrictions within each site would be decided in consultation with stakeholders. Appropriate management for **sandbanks** could include closure of a proportion of the feature's area to damaging gears, and there may be a greater requirement for restrictions on gears that penetrate more deeply into the sediment. The location of areas to be covered by management restrictions within each site would need to be decided in consultation with stakeholders, taking into account ecological factors and the sensitivity of the feature. Restrictions could be permanent in some cases or temporary/adaptive in others. The risks to achieving the conservation objectives decrease as the size of areas restricting pressure increase.	Act (2009), prohibiting the use of bottom towed gears. **Inner Dowsing, Race Bank and North Ridge:** Three areas of *Sabellaria* reef within 12nm (Lynn Knock and Docking Shoal reefs) are already subject to a byelaw[5] under the Marine and Coastal Access Act (2009), prohibiting the use of bottom towed gears. More recent survey data from Cefas and EIFCA have delineated more extensive reef and also identified further areas which are likely to support reef. However, these areas are almost exclusively within the 6nm limit. For **Margate and Long Sands,** The Marine Management Organisation is currently carrying out an assessment for the whole of the Margate and Long Sands site (0-12nm) with input from Kent and Essex IFCA to ascertain whether management measures are required. The draft will be sent to Natural England for comments and is expected to be finalised by August 2015.
Option 3: Remove/avoid pressures	This option would reduce the risk of not achieving the conservation objectives for **sandbanks slightly covered by sea water all the**	**Haisborough, Hammond and Winterton:** The site boundary already includes a margin of 100m around

[5] The Inner Dowsing, Race Bank and North Ridge European Marine Site (specified areas) bottom towed fishing gear byelaw (MMO, 2013b)

	time and **reef** to the lowest possible levels. Restrictions would be required for all mobile bottom contact gears within the full extent of the site boundaries.	the outermost point of the sandbank feature except where a straight line between two points was the more sensible option to avoid an overcomplicated site boundary. **Inner Dowsing, Race Bank and North Ridge:** The boundary already includes a margin of 100m around each sandbank structure (as defined by Klein 2006) except where a straight line between two points was the more sensible option to avoid an overcomplicated site boundary. **North Norfolk Sandbanks and Saturn Reef:** No margin to allow for mobile gears was applied to the site boundary given the shallow water depth and the lack of a precise feature edge. The boundary allows for the potential elongation of banks in a north-easterly direction.

Table 5. *Management options for static bottom contact gear*

Management option	Risk to achieving the conservation objectives	Site specific comments
Option 1: No additional management	This option is considered unlikely to pose a risk of not achieving the conservation objectives for **sandbanks which are slightly covered by sea water all the time** and **reefs**. However, if monitoring of condition and fishing activity showed evidence of detrimental effects as a result of	

	static gear activity in the future, additional management may be required.	
Option 2: Reduce/limit pressures	This option would further reduce the risk of not achieving the conservation objectives for the **sandbanks which are slightly covered by sea water all the time** and **reefs**. If fishing activity were to rise to levels at which damage was occurring, appropriate management could include partial closure of the feature and/or limits on the amount of gear that can be deployed.	

b. for red-throated divers

Table 6. *Management options for red-throated divers (all fishing gears)*

Management option	Risk of significant impact
Option 1: No additional management	There is a risk of risk of not achieving the conservation objectives for **red-throated diver**, resulting from habitat impacts, non-physical disturbance and commercial extraction of prey species. It is not considered that this option would pose a significant risk of **bycatch** However, if monitoring of condition and fishing activity showed evidence of detrimental effects as a result of static gear activity in the future, additional management may be required.
Option 2: Reduce/limit pressures	This option would reduce the risk of not achieving the conservation objectives for **red-throated divers,** resulting from impacts on **habitats** and **prey species** and **disturbance**. Appropriate management measures for mobile bottom contacting gears are likely to be similar to those considered for the Margate and Long Sands SAC, which overlaps this site. Additional management to reduce the

	risk from disturbance may include some area restrictions on the use of pelagic and static gears. This should be adaptive and must be considered in the context of other vessel movements and the seasonality of red-throated diver presence within the site. Since many of the prey species of red-throated dives are highly mobile with ranges extending well beyond the site boundary, it is unlikely that any site specific management options could be identified that would reduce the risk of stock depletion. Management to prevent prey depletion would be on a wider geographical scale and is beyond the scope of current management discussions.
Option 3: Remove/avoid pressures	This option would reduce the risk of risk of not achieving the conservation objectives for **red-throated divers** to the lowest possible level.

9. Conclusions and further recommendations

Fisheries management measures for these sites will be developed through discussion with stakeholders and other Member States. Discussions will focus on refining our understanding of the features and the likely risks to the designated features, where interactions with fishing activities occur. Based on the options presented here, it is hoped that a preferred set of management options will be recommended. This will form the basis of management measure proposals to be submitted to the EU under the Common Fisheries Policy.

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Annex 1: Fishing activity maps

Figure 2. *Southern North Sea site boundaries with associated VMS data for >15m UK-registered beam trawl fishing vessels for the years 2009-2013*

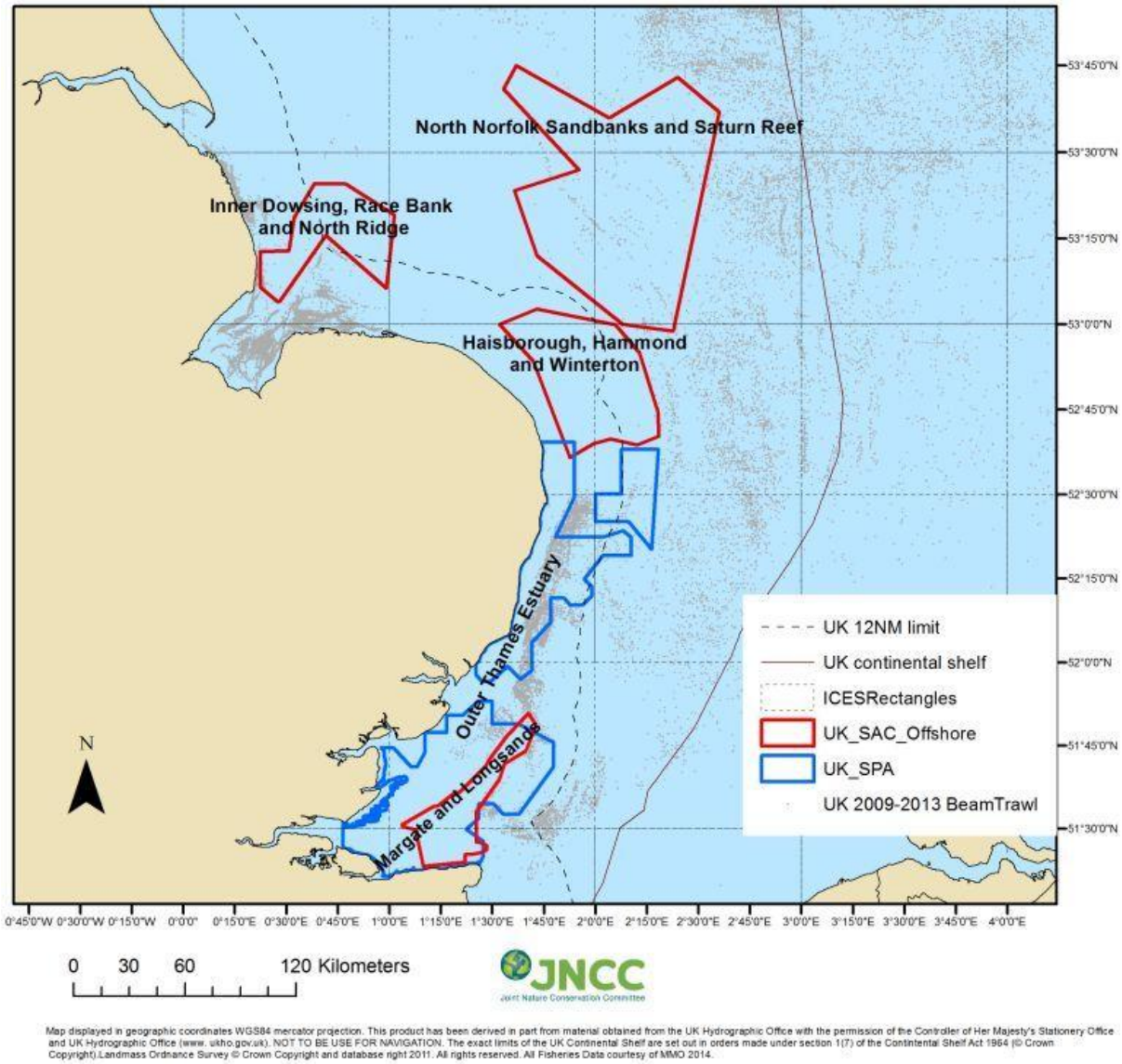

Figure 3. *Southern North Sea site boundaries with associated VMS data for >15m UK-registered otter trawl fishing vessels for the years 2009-2013*

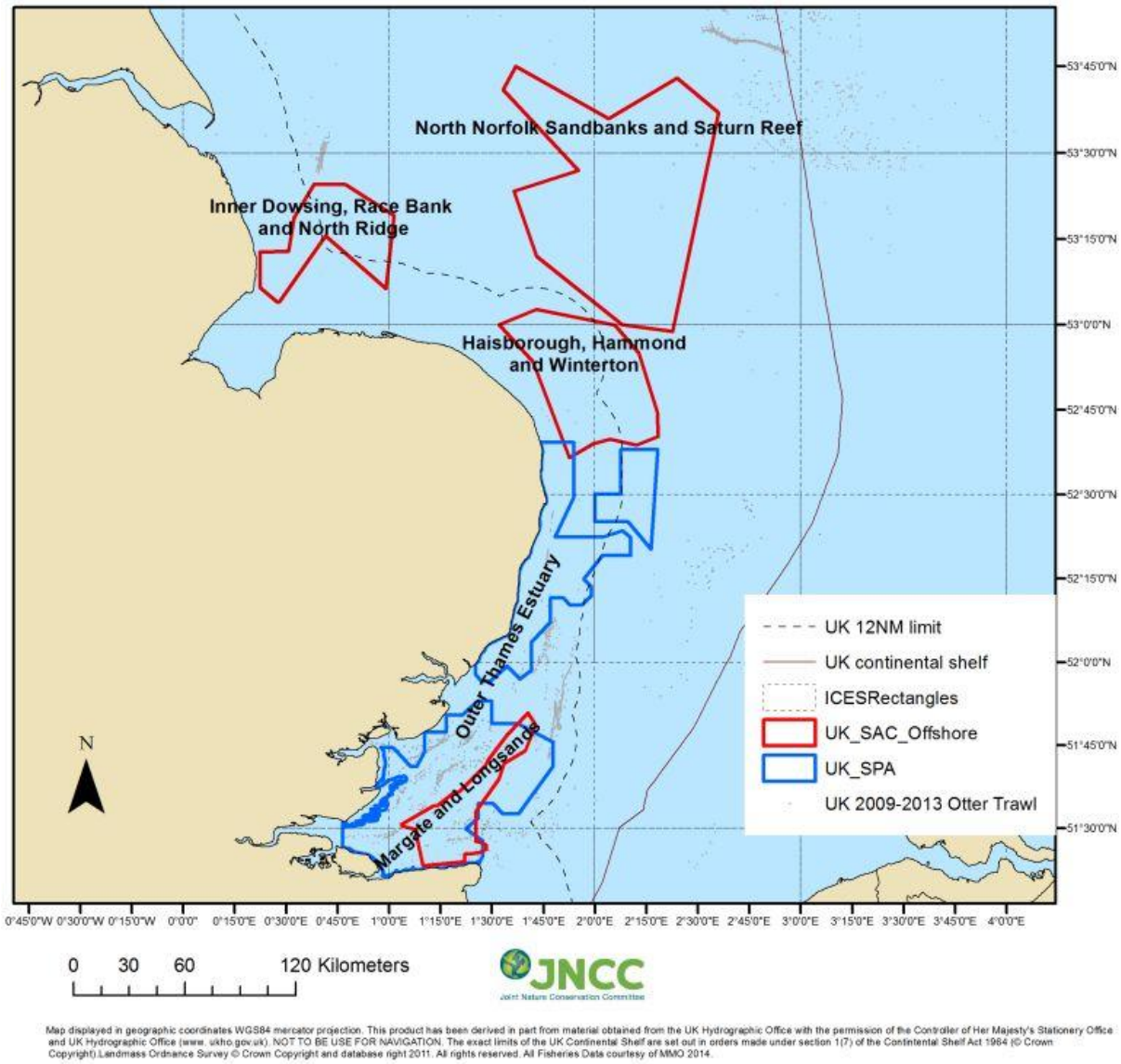

Figure 4. *Southern North Sea site boundaries with associated VMS data for >15m UK-registered static gear fishing vessels for the years 2009-2013*

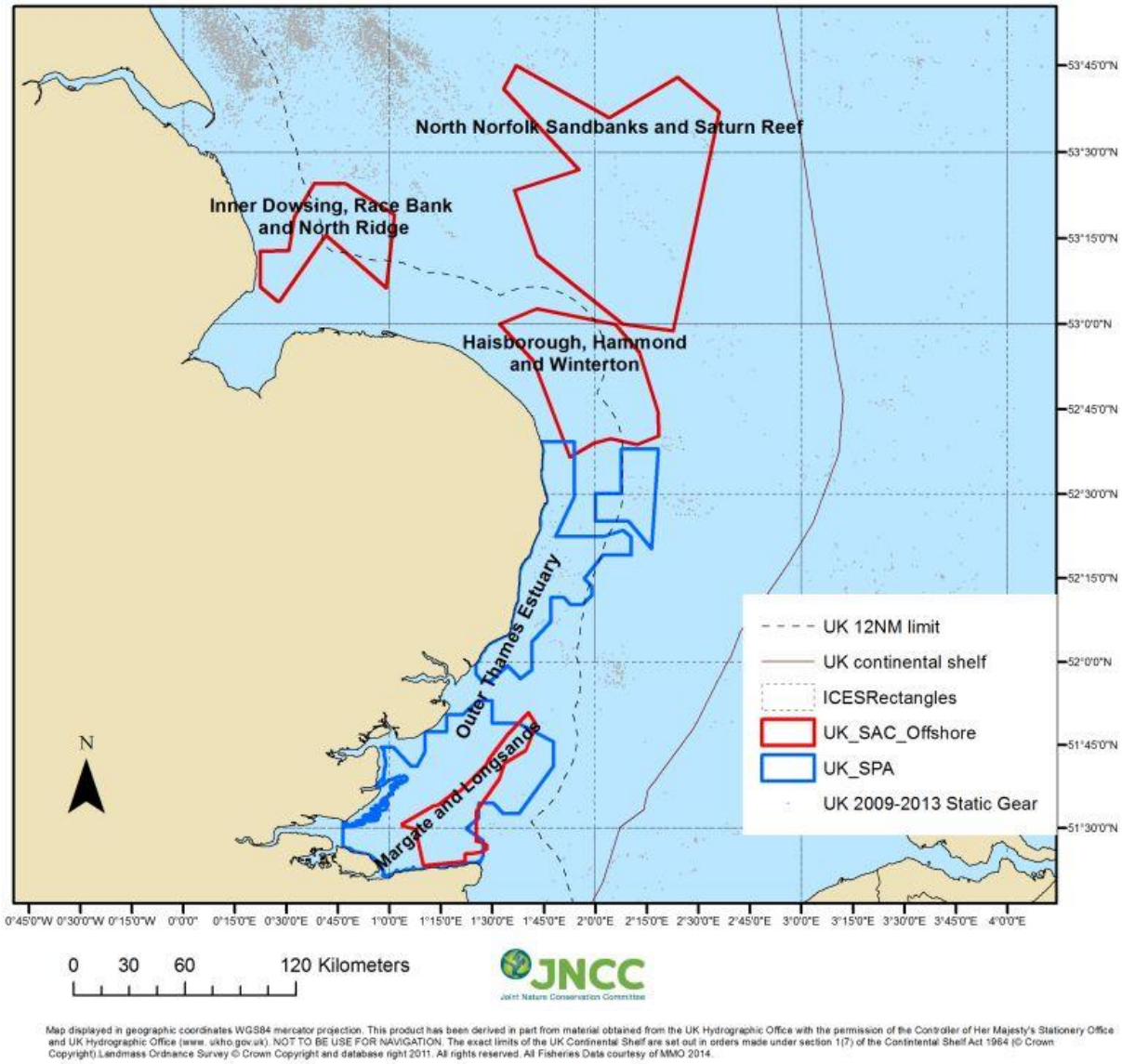

Figure 5. *Southern North Sea site boundaries with associated VMS data for >15m non-UK-registered beam trawl fishing vessels for the years 2009-2013*

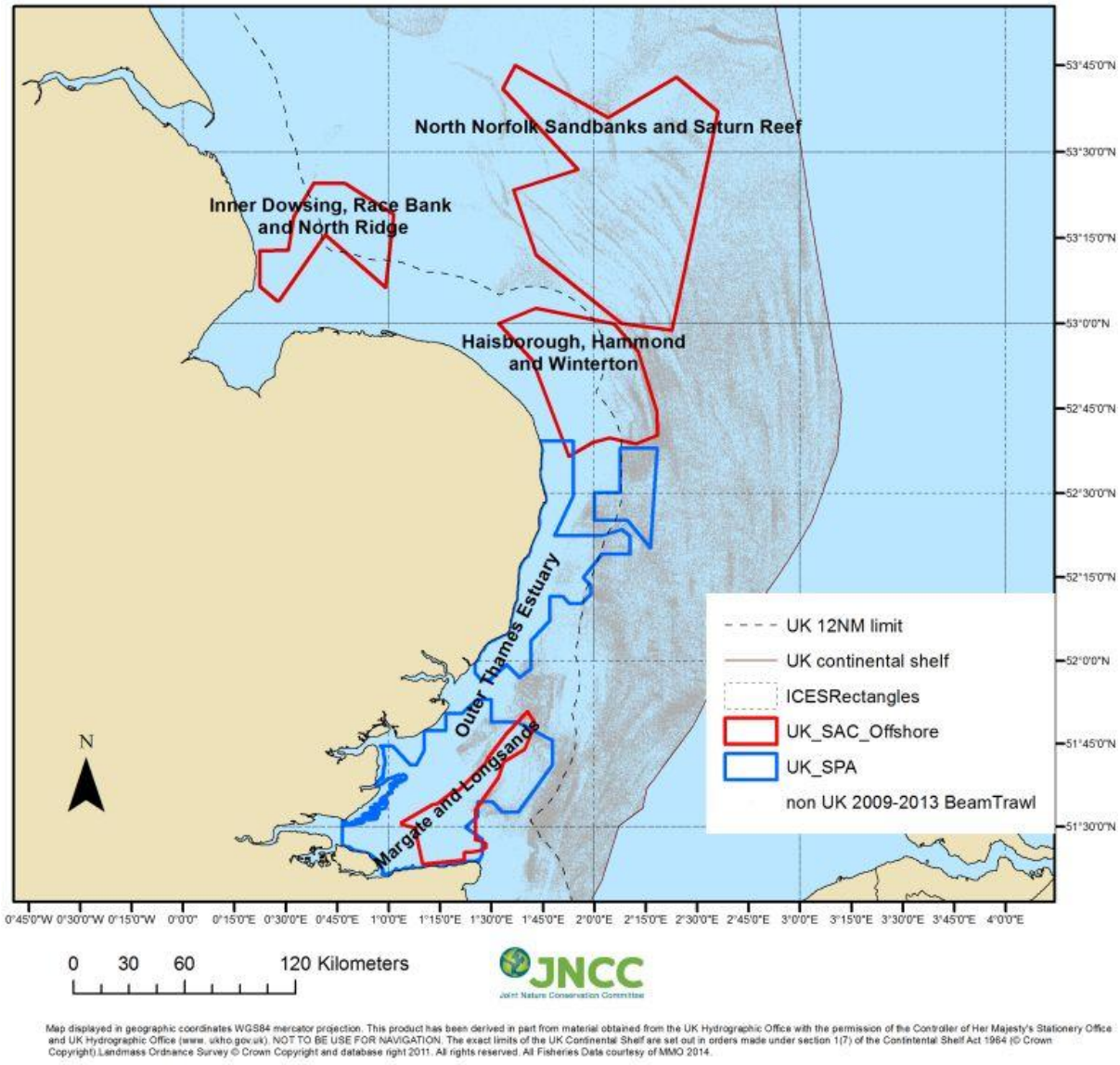

Figure 6. *Southern North Sea site boundaries with associated VMS data for >15m non-UK-registered otter trawl fishing vessels for the years 2009-2013*

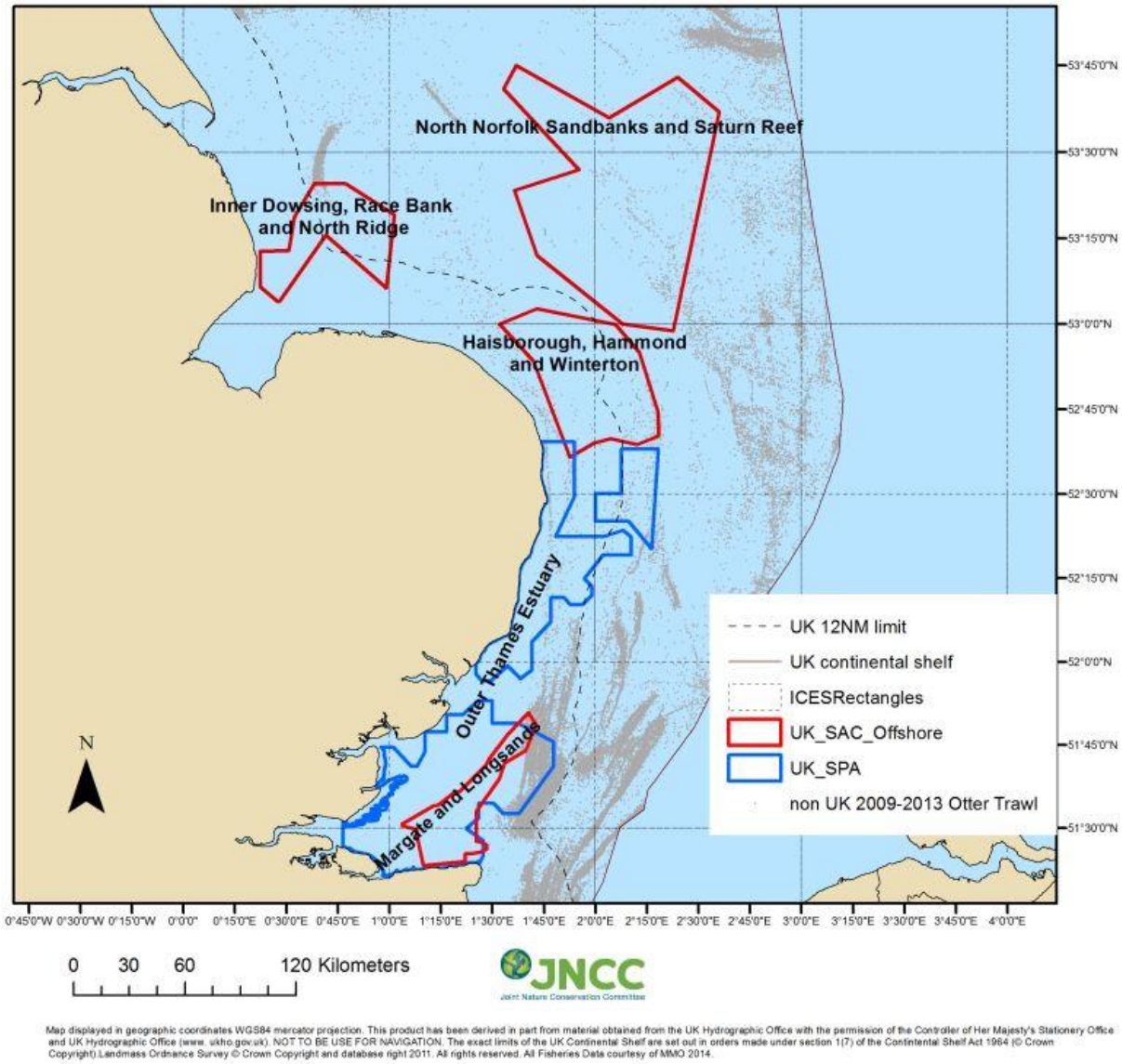

Figure 7. *Southern North Sea site boundaries with associated VMS data for >15m non-UK-registered static gear fishing vessels for the years 2009-2013*

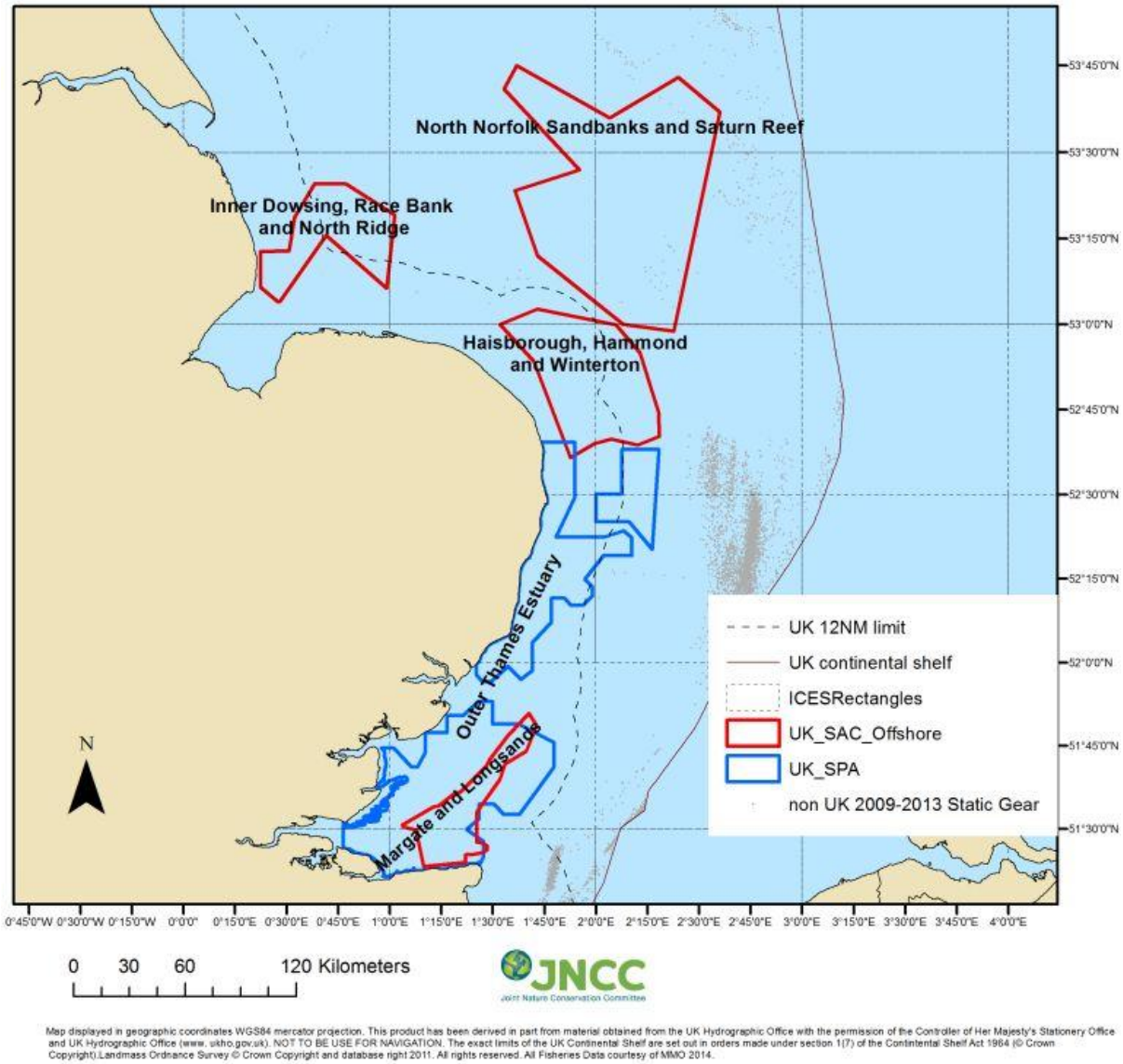

Figure 8. *Cefas Inshore Fisheries Data Layer - Relative fishing effort distribution for vessels under 15m length, from sightings and boardings data (figure from Vanstaen & Silva, 2010)*