Scottish MPA Project
Data Confidence Assessments

FIRTH OF FORTH BANKS COMPLEX NATURE CONSERVATION MPA

JULY 2014

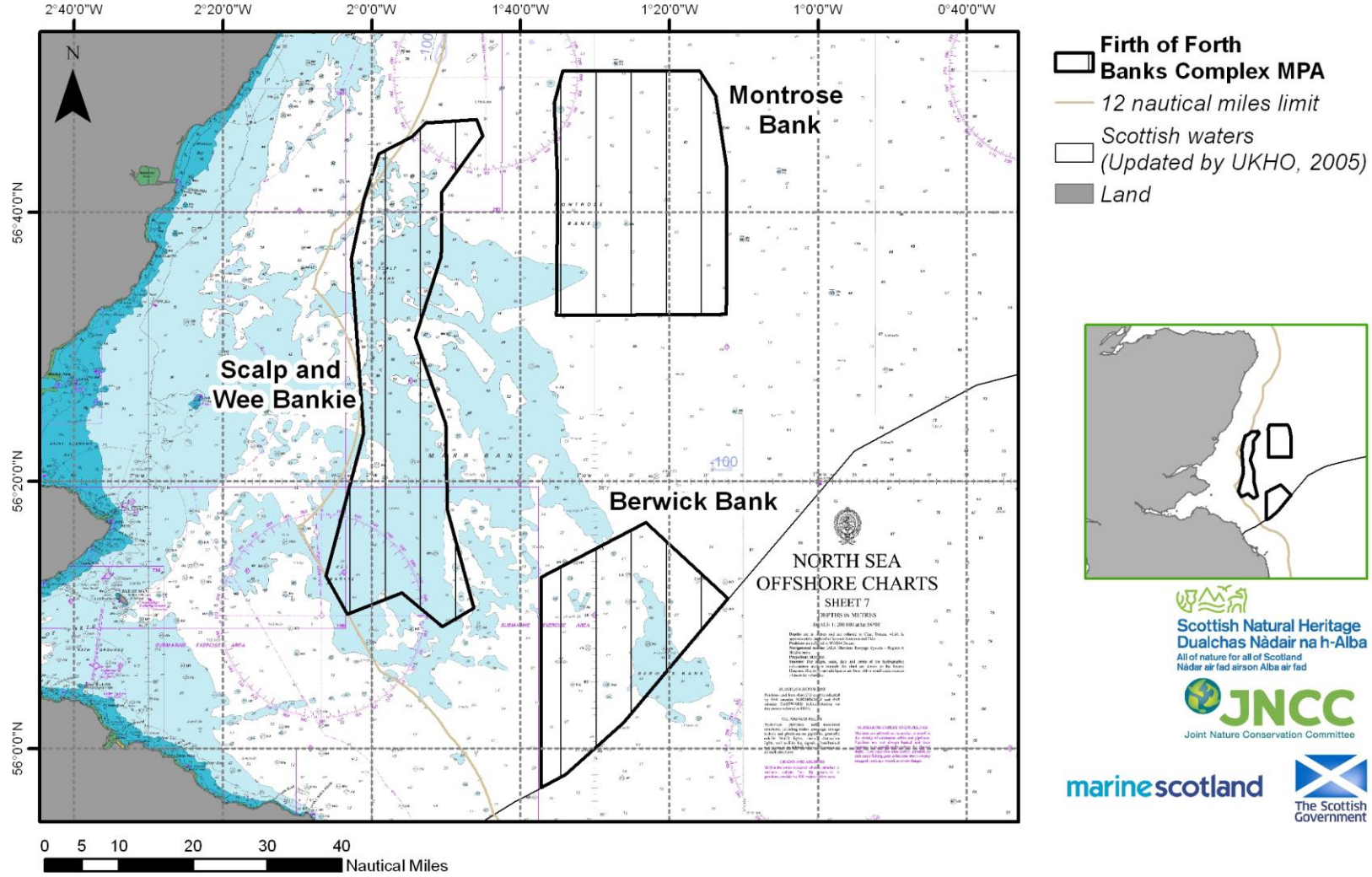
The following documents provide further information about the Firth of Forth Banks Complex Marine Protected Area (MPA):

- Site Summary Document
- Detailed assessment against the MPA Selection Guidelines
- Management Options Paper

The documents are all available at www.jncc.defra.gov.uk/page-6480

Document Distribution List and Version Control				
Format	**Version**	**Issue date**	**Version development and review**	**Issued to**
Electronic	2.0	11/04/2013	Internal drafting and review of pre-version 2.0 drafts by JNCC SMPA team and Grade 7 staff and editorial review prior to release to MPA Sub Group	MPA Sub Group
Electronic	3.0	10/06/2013	Review of document to take into account MPA Sub-Group comments by JNCC SMPA team prior to release to MPA Sub Group for sign-off	MPA Sub Group
Electronic	4.0	12/07/2013	Review of document to take into account MPA Sub-Group comments by JNCC SMPA team and editorial review before release of document for public consultation.	Uploaded to JNCC website
Electronic	5.0	09/07/2014	Document update to align with designation status and text revised in response to consultation and independent review report	Delivery to Marine Scotland to support MPA designation and upload to JNCC website

Figure 1 Map of the Firth of Forth Banks Complex MPA



Map projected in Mercator (World) projection, geographic coordinate system WGS1984. The exact limits of the UK Continental Shelf are set out in the Continental Shelf (Designation of Areas) Order 2013, Statutory Instrument 2013/3162 (© Crown Copyright). Landmass, Ordnance Survey © Crown Copyright and database right 2011. All rights reserved. Scotland (Adjacent waters) Updated by the Law of the Sea Division, United Kingdom Hydrographic Office October 2005. MPA © JNCC and SNH, 2014. All rights reserved. Admiralty Chart © Crown Copyright, 2013. All rights reserved. License No. EK001-20130405.
NOT TO BE USED FOR NAVIGATION

MPA name	Firth of Forth Banks Complex	Date of initial assessment	16th Aug 2012	Assessors	ALR, NC, PC, ML, OCA

The Firth of Forth Banks Complex MPA is recommended for the protection of offshore subtidal sands and gravel habitats on the shelf (OSSG), ocean quahog (*Arctica islandica*) aggregations (OQ; an OSPAR threatened and/or declining species), shelf banks and mounds (SBM), and the moraine features representative of the Wee Bankie key geodiversity area (Brooks *et al.,* 2013). The MPA incorporates three shelf bank and mound features – Montrose Bank, Berwick Bank, and Wee Bankie including Scalp bank, included for their significance in supporting the wider ecosystem function of Scotland's seas. The area was selected following consideration of least damaged/more natural locations (East of Marr and Montrose Banks) as detailed in Chaniotis *et al.* (2011) and other area-based measures as detailed in Cunningham *et al.* (2011). The boundaries of the MPA were drawn to focus on the extent of the shelf bank and mound large-scale feature (considered to be of functional significance to the health and biodiversity of Scotland's seas), records of ocean quahog, and to represent the range in diversity of offshore subtidal sand and gravel habitats within the area. A lack of evidence of any functional significance resulted in Marr Bank being excluded from the areas identified for protection.

Protected features			
Biodiversity	Offshore subtidal sands and gravels (OSSG) on the shelf Ocean quahog aggregations (Arctica islandica) (OQ) Shelf banks and mounds (SBM)	**Geodiversity**	Overlaps with a Key Geodiversity Area – Wee Bankie Moraines from the Quaternary of Scotland Block (Map D) (Brooks *et al.,* 2013)

Feature exclusions (MPA search features recorded within the MPA but excluded from the assessment with reasons)

Burrowed mud - Analysis of the photographic samples collected on the 2011 JNCC Firth of Forth Banks Complex Survey (Axelsson *et al.,* 2014) indicate the presence of the phosphorescent sea pen (*Pennatula phosphorea*) on muddy sand at one station west of Wee Bankie. This was initially considered as an opportunity to increase the representation for sea pens and burrowing megafauna on circalittoral fine mud but the quality of the example and the features' extent in the area is not well understood. As such it has been excluded from further assessment.

Offshore deep sea muds on the continental shelf – Analysis of the photographic samples collected on the 2011 JNCC Firth of Forth Banks Complex Survey (Axelsson *et al.,* 2014) indicate the presence of sandy mud at the same stations as above to the west of the Wee Bankie. However, the Particle Size Analysis (PSA) results from the coincident grab sample, as well as nearby British Geological Survey (BGS) PSA results contradict the sediment type determination reporting the presence of Folk classes matching sands. This contradiction, together with the lack of further evidence of the feature in the area, has resulted in its exclusion from further assessment.

Sandeels - The Firth of Forth Banks Complex pMPA overlaps entirely with the area closure for sandeel fisheries in ICES sub-area IV[1]. This fishery measure is a year round closure on sandeel fishing with the exception of a commercial monitoring fishery with a precautionary Total Allowable Catch. Re-opening criteria have not been set for the fisheries closure, but should the closure be removed in the future the decision not to include sandeels as a protected feature will need to be reviewed.

[1] Regulation (EU) no 227/2013 of the European Parliament and of the Council of 13 March 2013
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:078:0001:0022:EN:PDF

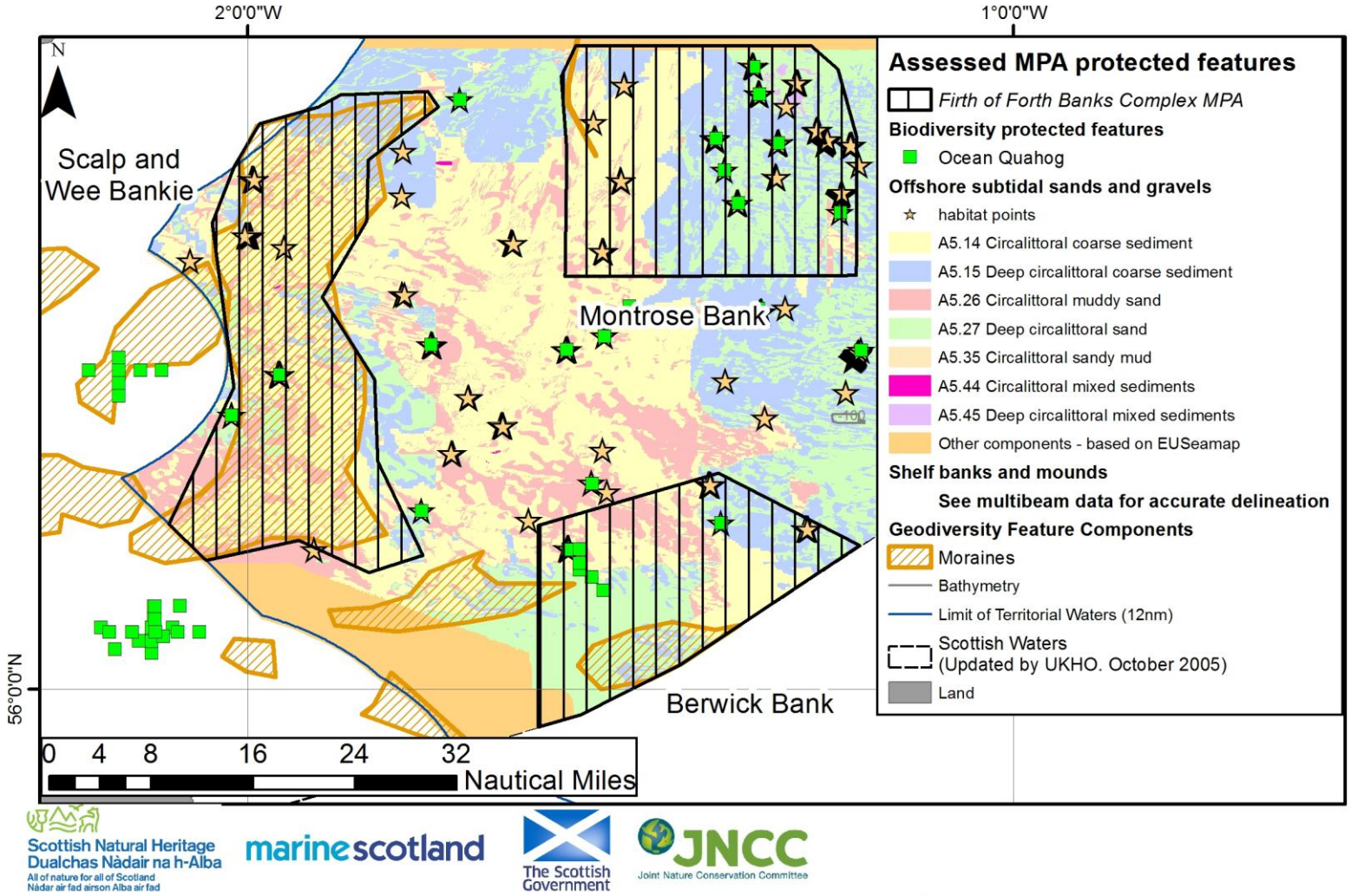
Data used in assessment			
Version of GeMS holding feature data used to support site selection	Ver.4	**Other datasets used** (not in GeMS) – [superscripts are used to reference these datasets in the following discussion]	• [1]British Geological Survey (BGS) seabed substrate map for the Firth of Forth Banks area, developed under the Agreement for Partners (Marine Scotland (MS), National Oceanography Centre (NOC), BGS, Marine Scotland Science (MSS), JNCC and Scottish Natural Heritage (SNH))for the implementation of processing and interpretation of multibeam backscatter data for Scotland's seas and other parts of marine waters off the United Kingdom. • [2]Processed high resolution multibeam and backscatter data from the Maritime and Coastguard Agency developed under the above agreement (Marine Scotland (MS), National Oceanography Centre (NOC), BGS, Marine Scotland Science (MSS), JNCC and Scottish Natural Heritage (SNH)). • [3]British Geological Survey (BGS) Marine Particle Size Analysis (PSA) dataset (February 2012) - data collected between 1967 and 1987 categorised according to the Folk classification and subsequently to the EUNIS habitat classification by JNCC based on the BGS modified Folk scheme • [4]Habitat maps generated from the interpretation of UK Hydrographic Office (UKHO) acoustic data and biological samples collected during the 2011 NLV Pole Star survey (Sotheran & Crawford-Avis, 2014a & 2014b) • [5]EuSeaMap habitat modelling project habitat map (Cameron and Askew, 2011). Note that the product used in the maps is the 2012_08 version, which is an improvement on that published in the 2011 report

Summary of data confidence assessment (see detailed assessment on following pages)						
Confident in underpinning data	**Yes**	✓	**Partial**	**-**	**No**	**-**

Confident in presence of identified features?	✓ all features	**Data suitable to define extent of individual protected features**	**Yes**	**Partial**	**No**
			OSSG SBM	OQ	-

Summary	JNCC are confident in the presence of ocean quahog and offshore subtidal sands and gravel habitats in the MPA. The majority of biodiversity feature data have been collected during a dedicated survey which took place in 2011 sampling across the area using benthic grab and photographic sampling gear. The evidence for the presence of the offshore sands and gravels feature is further supported by the broad coverage of PSA results from BGS sampling confirming the sediment types, which underpin both the predictive habitat mapping by the EuSeaMap project used in this assessment and the refined seabed substrate map[1] (Map H) and habitat map[5] (Map I) based on the high quality multibeam and backscatter datasets[2]. These data and information provide us with high confidence in the extent of offshore subtidal sands and gravel habitats in the MPA. Initial information on the location of the shelf bank and mound features were derived from UK Hydrographic Office (UKHO) Admiralty charts then refined using high resolution multibeam and backscatter data[2] (Maps F & G) from the MCA/UKHO. These data give us high confidence in the presence and extent of the features. Wee Bankie (including Scalp Bank) and Berwick Bank are considered to have functional significance to the health and diversity of Scotland's seas. Although the data were collected in 2011, we are less confident in our knowledge of the distribution of ocean quahog aggregations in the MPA. The information on the species extent is limited to the survey sampling effort used when generating presence data for ocean quahog. However, ocean quahog are known to occur in a range of sediments from coarse clean sand to muddy sand in the infralittoral, circalittoral, circalittoral offshore and bathybenthic offshore environment – inhabiting a depth range from 4-400m (Witbaard & Bergman, 2003; Sabatini & Pizzolla, 2008). We have used the distribution of BGS sediment samples classified according to the modified Folk classification scheme using PSA results, EUSeaMap data and recent seabed habitat sampling from the 2011 NLV Pole Star survey to verify the presence of potentially suitable habitat for ocean quahog populations as a proxy to define the possible presence of the feature.

Figure 2 Map of the known distribution of protected features within the Firth of Forth Banks Complex MPA



Map displayed in geographic coordinates WGS84. The exact limits of the UK Continental Shelf are set out in the Continental Shelf (Designation of Areas) Order 2013, Statutory Instrument 2013/3162 (© Crown Copyright). Landmass Ordnance Survey © Crown Copyright and database right 2011. All rights reserved. Scotland (Adjacent waters) Updated by the Law of the Sea Division, United Kingdom Hydrographic Office October 2005. Bathymetry © GEBCO, 2011. Biological data from Geodatabase of Marine features in Scotland (GeMS v4) © Crown Copyright; MPA & geodiversity data © JNCC and SNH 2014. EUSeaMap © EUSeaMap consortium 2012 (www.emodnet-seabedhabitats.eu)

Data confidence assessment	JNCC's assessment of data confidence considered the age and source of the data, the type of sampling methodologies used and the overall coverage of data across the MPA

Age of data (Map A)			
Multiple or majority of records collected post 2000	OSSG OQ SBM	**Multiple records collected pre 2000**	-
Comments	The majority of data for ocean quahog, offshore subtidal sands and gravels and verification of suitable habitat for ocean quahog were collected during a dedicated habitat characterisation survey in 2011 and mapped in 2013/14[4]. Older data for ocean quahog records were available from a trawl survey conducted in 2000. Information on the location of the shelf bank and mound features were derived from UKHO Admiralty charts, and then subsequently superseded by data generated in 2011 from processing the high resolution UKHO multibeam and backscatter data collected between 2006 and 2008[2], which was in turn interpreted to generate the improved seabed sediment map[1]. PSA data from BGS were derived from sediment samples collected between 1967 and 1982. The underlying predictive habitat map was developed in 2011 (Cameron & Askew, 2011).		

Source of data (Map B)					
Targeted data collection for nature conservation purposes	✓	**Statutory monitoring (marine licensing etc.)**	-	**Fisheries survey work**	✓
Data collection associated with development proposals (EIA etc.)	-	**Recreational / volunteer data collection**	-	**Other** (specify) – EUSeaMap, UK Admiralty chart, BGS PSA data	✓
Comments	The majority of the offshore subtidal sands and gravels survey records were derived from surveys aboard the Northern Lighthouse Board vessel *RV Pole Star* and the Marine Scotland Science Vessel *RV Scotia*. The processed and interpreted multibeam and backscatter data were generated through a Memorandum Of Agreement between MS, MSS, JNCC, SNH, NOC & BGS[1]. The habitat mapping was commissioned by JNCC in 2013[4]. PSA data were derived from sediment samples collected by BGS[3]. Ocean quahog records were available from a trawl survey conducted in 2000 by Northumberland Coast Marine Biodiversity project and more recently from the dedicated 2011 survey. The EUSeaMap predicted habitat map used in this assessment was developed by a consortium led by JNCC (Cameron and Askew, 2011)[5]. Information on the location of the shelf bank and mound features were derived from UKHO Admiralty charts, digitised at a scale of 1:750,000 as part of the DEFRA-led data collation contract MB102. However the more recent processed multibeam bathymetry data illustrates the extent of the features more precisely[2].				

Sampling methods / resolution							
Feature	**Modelled**	**Acoustic / remote sensing**	**Remote video / camera**	**Infaunal - grab / core**	**Fisheries trawl**	**Diving**	**Sediment sampling**
OSSG	✓	✓	✓	✓			✓
OQ			✓	✓	✓		
SBM		✓					
Comments	A range of sampling methods were used to collect information of differing spatial resolution for the protected features. Photographic images were collected using a drop-frame camera on both 2011 surveys and infaunal samples within the MPA were collected using a 0.1m^2 Hamon grab on the Firth of Forth Banks survey. The multibeam and backscatter data provided by the Maritime and Coastguard Agency (MCA) via the UKHO covers most of the MPA area. The backscatter data (Map G) were processed by NOC using PRISM software, which was subsequently interpreted by BGS to develop a seabed substrate map (Map H) using their PSA database and derivatives of the multibeam data (Map F). The BGS PSA data[3] are from grab and core samples collected using various methods. It is acknowledged that the spatial accuracy of older PSA records may be limited in places where the Decca Main Chain or similar types of positioning systems will have been used that could produce poorer spatial accuracy by modern standards. Sub-surface PSA results from cores have not been reported here. The predictive seabed habitat mapping project EUSeaMap habitat map used in this assessment was developed by a consortium led by JNCC (Cameron and Askew, 2011)[5].						

Data coverage (Maps A to I)					
Across the MPA					
Numerous protected feature records evenly distributed across MPA?	**-**	**Numerous protected feature records scattered across the MPA with some clumping?**	✓	**Few or isolated protected feature records - possibly clumped?**	-
For Individual features					
Multiple records of individual protected features providing indication of extent and distribution throughout MPA?	✓	**Few or scattered records of specific protected features making extent and broad distribution assessment difficult?**	-	**Few or isolated records of specific protected feature records**	-
Are acoustic remote sensing data available to facilitate the development of a full coverage predictive seabed habitat map?	Yes – multibeam and backscatter data for most of the MPA area were provided by the MCA via the UKHO to Marine Scotland for use in the Agreement for Partners for the implementation of processing and interpretation of multibeam backscatter data for Scotland's seas and other parts of marine waters off the United Kingdom. The backscatter data have been processed by NOC[2], and BGS have used the outputs to create a refined seabed sediment map[1] (Map H). A habitat map[4] has been developed through commissioned work by JNCC (Map I).				

Data coverage (Maps A to I)	
Comments	***Offshore subtidal sands and gravels (OSSG) on the continental shelf*** • [5]EUSeaMap, version 2012_08 (Cameron and Askew, 2011)[2] - The habitat map predicts offshore subtidal sands and gravels occur across the entire MPA. A5.14 Circalittoral coarse sediment, A5.15 Deep circalittoral coarse sediment, A5.25 Circalittoral fine sand or A5.26 Circalittoral muddy sand and A5.27 Deep circalittoral sand are predicted to occur in each of the three parts of the Firth of Forth Banks Complex MPA, the latter being the most dominant sediment type (comprising ~48% of the MPA). A small patch (<1% of the MPA) of A5.45 Deep circalittoral mixed sediments is predicted to occur in the Montrose Bank part and in the western part around Wee Bankie and Scalp Bank. • [3]British Geological Survey (BGS) Marine Particle Size Analysis (PSA) dataset (February 2012) - These data comprise sediment sampling campaigns between 1967 and 1987 across the UK waters from which the PSA results were categorised according to Folk and subsequently to EUNIS categories/BGS modified Folk classification. Note these data underpin the BGS substrate map used by the seabed habitat modelling project EUSeaMap. The date range of sediment samples within MPA component parts described below is 1967–1982. ***Montrose Bank*** There are 16 sediment samples collected by the BGS within the predicted extent of offshore subtidal sands and gravels in the north-eastern part of the complex. Of the 16 samples, there are 11 records of the modified Folk class/EUNIS 'coarse sediment' (EUNIS A5.1), one record of 'mixed sediments' (EUNIS A5.4) and four records of 'sand and muddy sand' (EUNIS A5.2). ***Wee Bankie including Scalp Bank*** There are 81 sediment samples collected by the BGS within the predicted extent of offshore subtidal sands and gravels within the western part of the complex. There are 40 records of the modified Folk class/EUNIS 'coarse sediment' (EUNIS A5.1), 38 records of 'sand and muddy sand' (EUNIS A5.2), two records of 'mixed sediments' (EUNIS A5.4), and one record of 'mud and sandy mud' (EUNIS A5.3).The latter class is not representative of the OSSG search feature. ***Berwick Bank*** There are 20 sediment samples collected by the BGS within the predicted extent of offshore subtidal sands and gravels within the south-eastern part of the complex. There is one record of the modified Folk class/EUNIS 'coarse sediment' (EUNIS A5.1) and 19 records of 'sand and muddy sand' (EUNIS A5.2). • 2011 JNCC Firth of Forth Banks Complex survey (in GeMS v4) (Axelsson *et al.,* 2014) – JNCC photographic samples gathered during the JNCC Firth of Forth Banks Complex survey in 2011 across the MPA, were determined as proposed biotopes from the Circalittoral coarse sediment, Circalittoral mixed sediments, and Circalittoral muddy sand biotope complexes. Proposed biotopes identified in this work may be considered, alongside those from other work streams, in the planned development of the offshore section of the Marine Habitat Classification of Britain & Ireland. • Biotope analysis of 2011 JNCC Firth of Forth Banks Complex survey infaunal samples (in GeMS v4) (Pearce *et al.,* 2014) – 44 grab samples from the 2011 survey to the Firth of Forth Banks Complex lie within the MPA. Of the 44, four habitat

[2] Note that the product used in the maps is the 2012_08 version, which is an improvement on that published in the 2011 report

Data coverage (Maps A to I)	
	classifications were determined all of which were new biotope proposals. 18 samples were classified under the offshore circalittoral coarse sediments habitat type. 21 samples were classified under the offshore circalittoral sand habitat type. The remaining 5 were classified under the offshore circalittoral mixed sediments habitat type. • International Bottom Trawl Survey Quarter 3 Survey (in GeMS v4) (Goudge and Morris, 2014) - A cluster of photographic imagery samples from a station opportunistically sampled during an MSS survey conducted in 2011 verify the presence of offshore subtidal sands and gravels (specifically A5.27 Deep circalittoral sand) biotopes to the east of the Montrose Bank. • [4]Habitat maps generated from the interpretation of UKHO acoustic data and biological samples collected during the 2011 NLV Pole Star survey (Sotheran & Crawford-Avis, 2014a & b) – Three blocks of full coverage multibeam data covering the approaches to the Firth of Forth, were collected on behalf of the UKHO/MCA between 2006 and 2008. These data were processed and interpreted by NOC and BGS to generate new seabed substrate layers (Map H). Applying a rule-based mapping approach, these substrate maps were combined with other physical parameter data layers (light penetration & energy) to generate a habitat data layer to level 4 of the EUNIS habitat classification scheme (Map I). The resulting habitat extent data layer shows that the predominant seabed habitats to be sands and coarse sediments within the circalittoral and deep circalittoral biological zones. The eastern area has seabed habitats comprising of offshore deep circalittoral sands (A5.27) with areas of raised bathymetry and small banks of offshore deep circalittoral coarse sediment (A5.15). As the seabed shallows toward the Wee Bankie area, the raised banks remain of a coarse sediment nature but change in their biological zone to become circalittoral (A5.14). This scenario remains the case over the raised areas of this region, with the troughs and deeper channels holding circalittoral muddy sands (A5.26) and deep circalittoral sands (A5.27). There is general agreement in the presence and distribution of the main habitats between these data and the EUSeaMap model. The significant difference is that these recent data have a far greater spatial resolution and accuracy in habitat extent. The acoustic data were also subject to the application of a probability-based mapping approach incorporating object-based image analysis and supervised classification. This approach generated probability distribution maps of the different habitat classes which were determined by the biological analysis of the ground-truthing samples. The technique also allowed for the generation of layers showing the distribution of mapping certainty. Whilst these habitat probability and certainty layers are not shown here they can be used to aid understanding of feature distribution and any conflict in the likelihood of habitat presence and extent come about from the probability-based approach. The rule-based mapping approach has been applied to the block over Berwick Bank more recently as part of a second phase of the work of Sotheran and Crawford-Avis, 2014b (Map I). ***Ocean quahog (Arctica islandica) aggregations (OQ)*** • 1999-2001 Northumberland Coast (Berwick to Tynemouth) Marine Biodiversity project (in GeMS v4) - Records of ocean quahog (*Arctica islandica*) from a trawl survey conducted in 2000 show the presence of this feature to the north-east of Berwick Bank. The determination of the records was recorded as 'certain'. • 2011 JNCC Firth of Forth Banks Complex survey (in GeMS v4) – The analysis of the infaunal grab samples found juvenile ocean quahog at 11 sampling stations within the MPA. Between one and five juveniles were found at each sampling station.

Data coverage (Maps A to I)	
	Seven of the sampling stations were within the Montrose Bank part of the MPA; two were on Wee Bankie and the remaining two were in the Berwick Bank part of the MPA. Adults were also found at the two sampling stations in the Berwick Bank part. ***Shelf banks and mounds (SBM)*** • UKHO Admiralty Charts (in GeMS v4) - The MPA includes the Wee Bankie, Scalp Bank, Montrose Bank and Berwick Bank large scale features included in the Firth of Forth Banks Complex MPA. Data on the location of the shelf bank and mound features were derived from interpretation of UKHO Admiralty charts. • [2]High resolution multibeam (Map F) and backscatter (Map G) data (supplied by the Maritime and Coastguard Agency) were processed into bathygrids by BGS (BM) and NOC (BS). These data provided higher resolution datasets with which to better define the extent of the shelf bank and mound features. ***Geodiversity*** • The Wee Bankie including Scalp Bank part of the MPA includes features representative of the Wee Bankie Key Geodiversity Area. This includes moraines from the Quaternary of Scotland block. The moraines are interpreted as marking an ice limit at some stage during ice retreat from the Last Glacial Maximum. They remain scientifically important because they have a key role to play in furthering understanding of the deglaciation history of the last British-Irish Ice Sheet (Brooks *et al.,* 2013) (Maps D & E).

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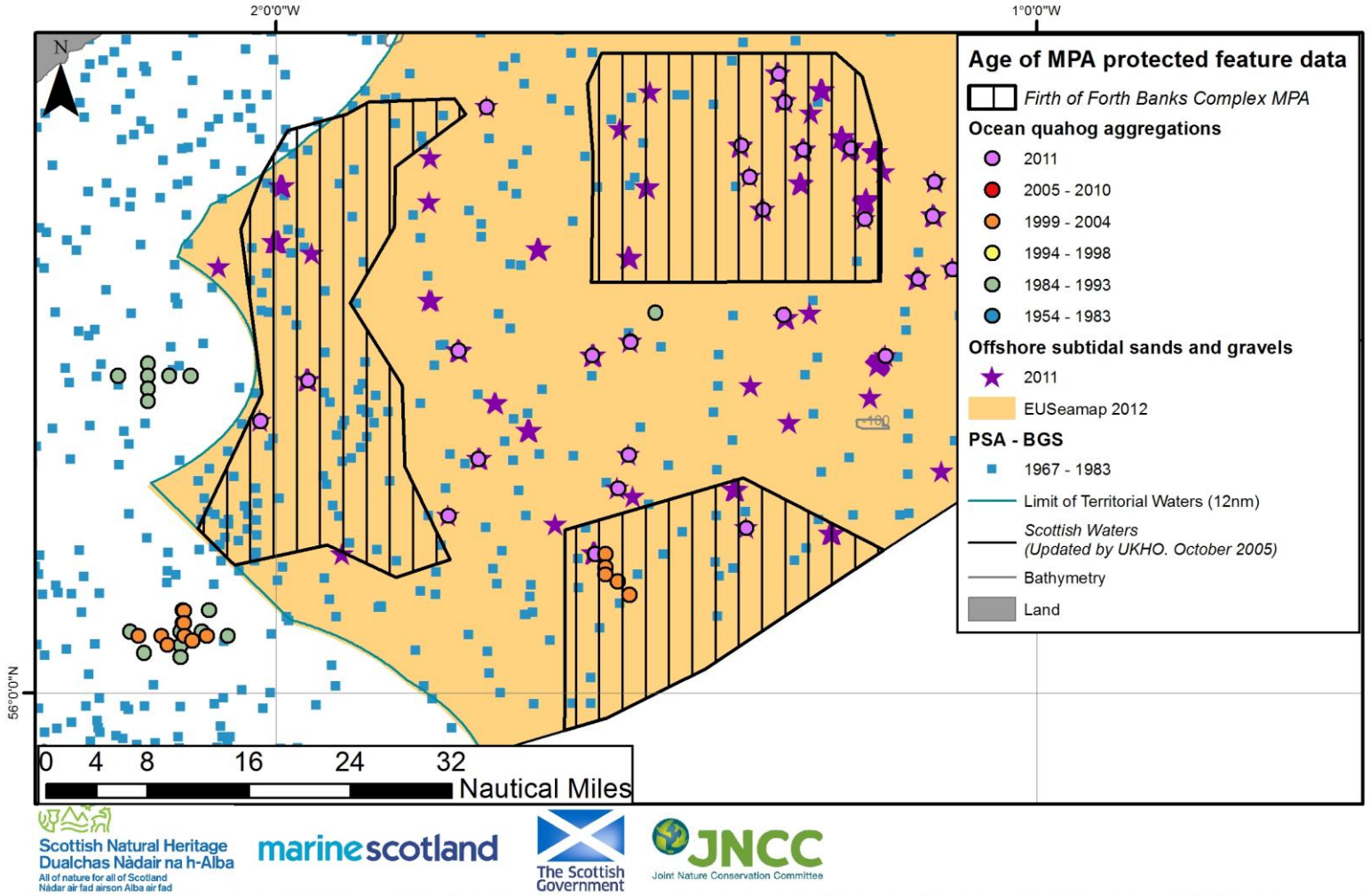

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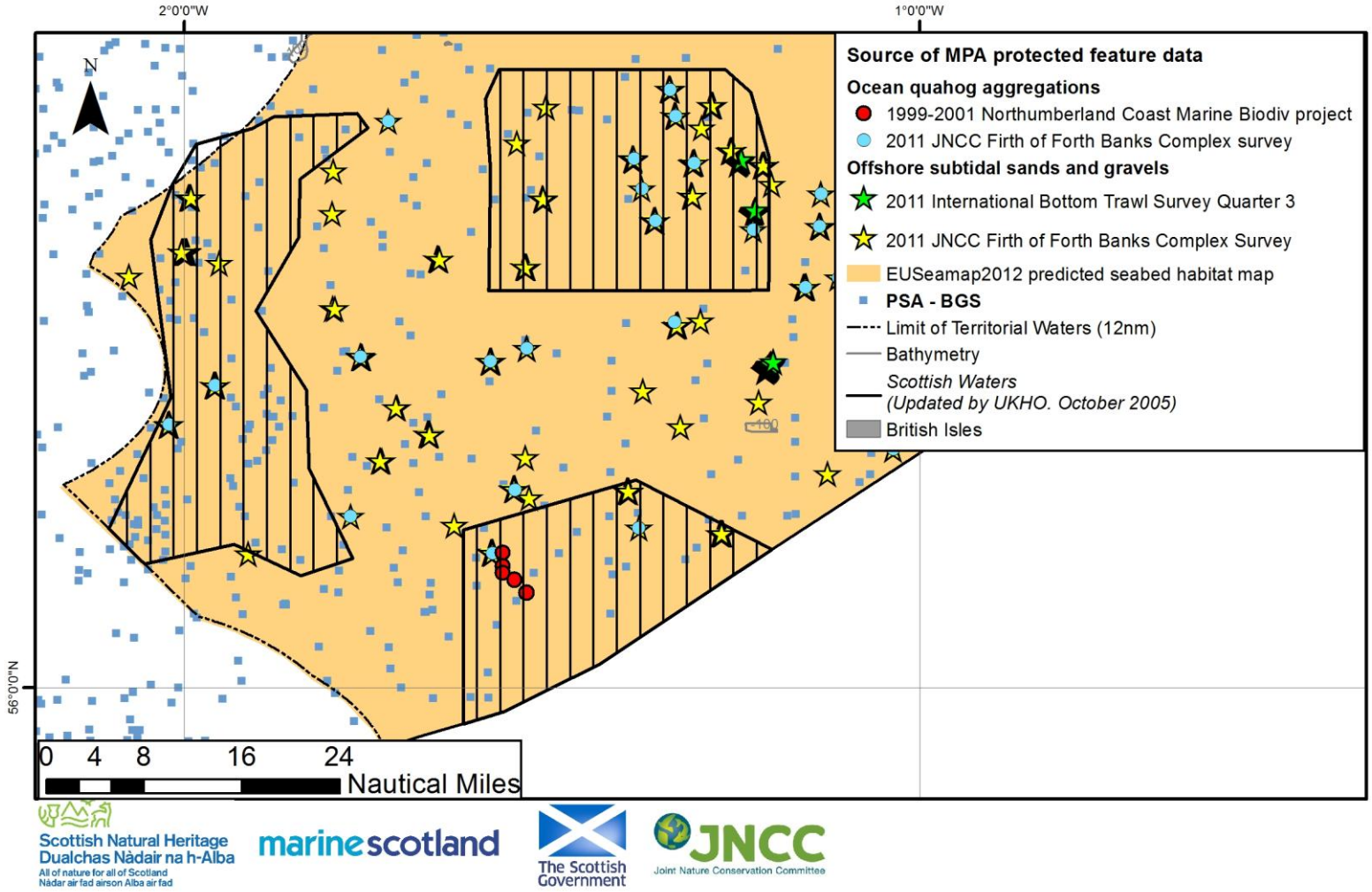

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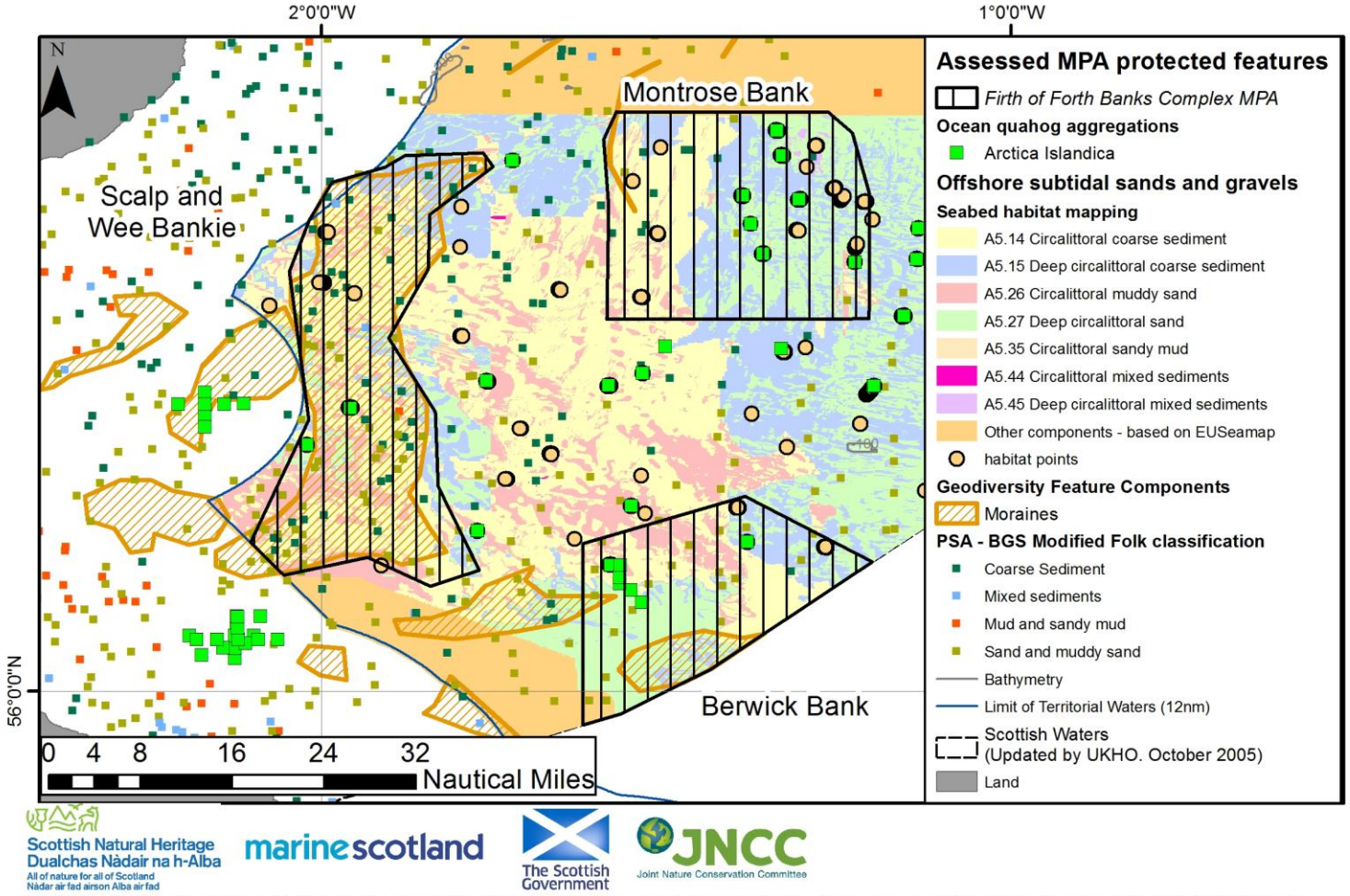

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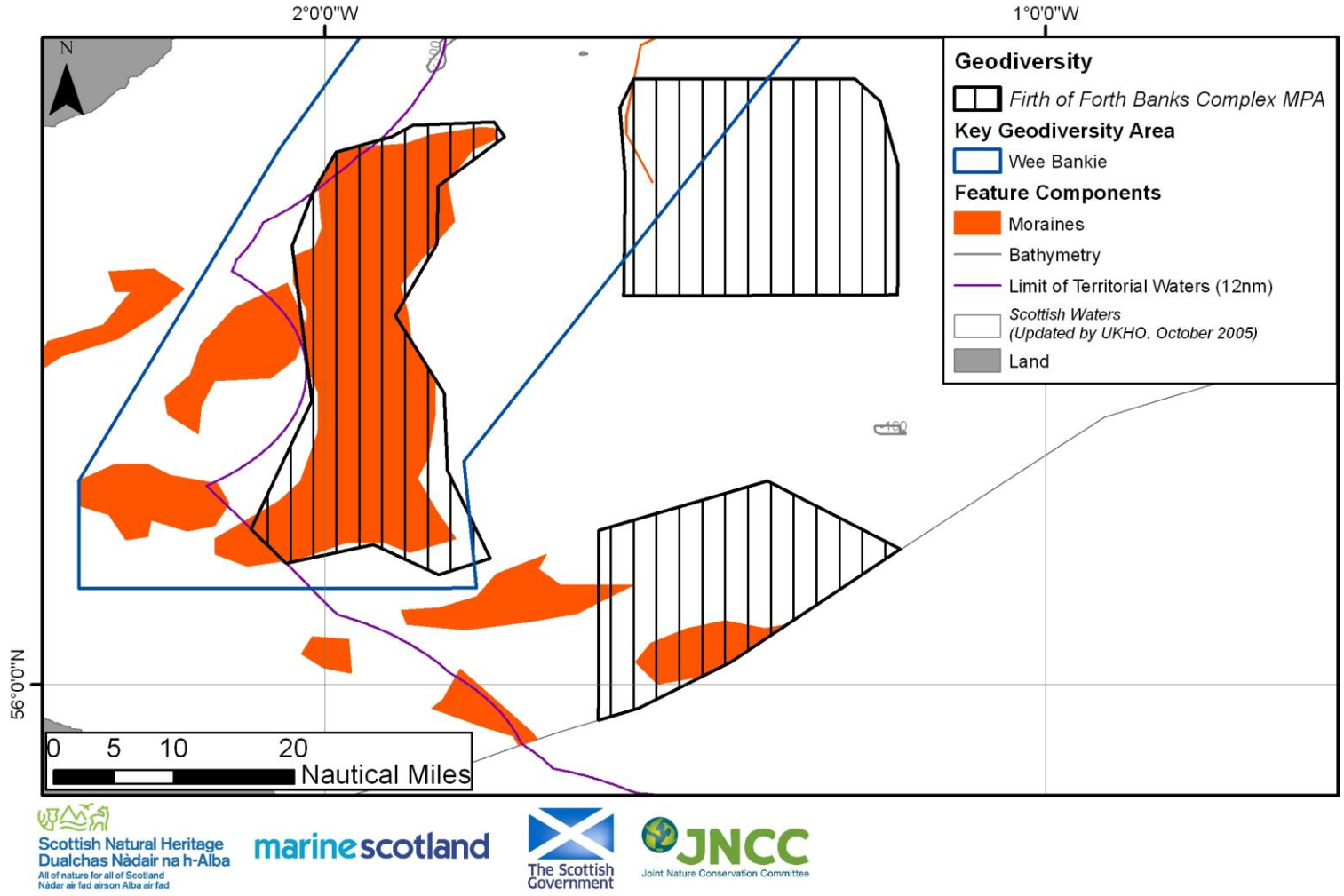

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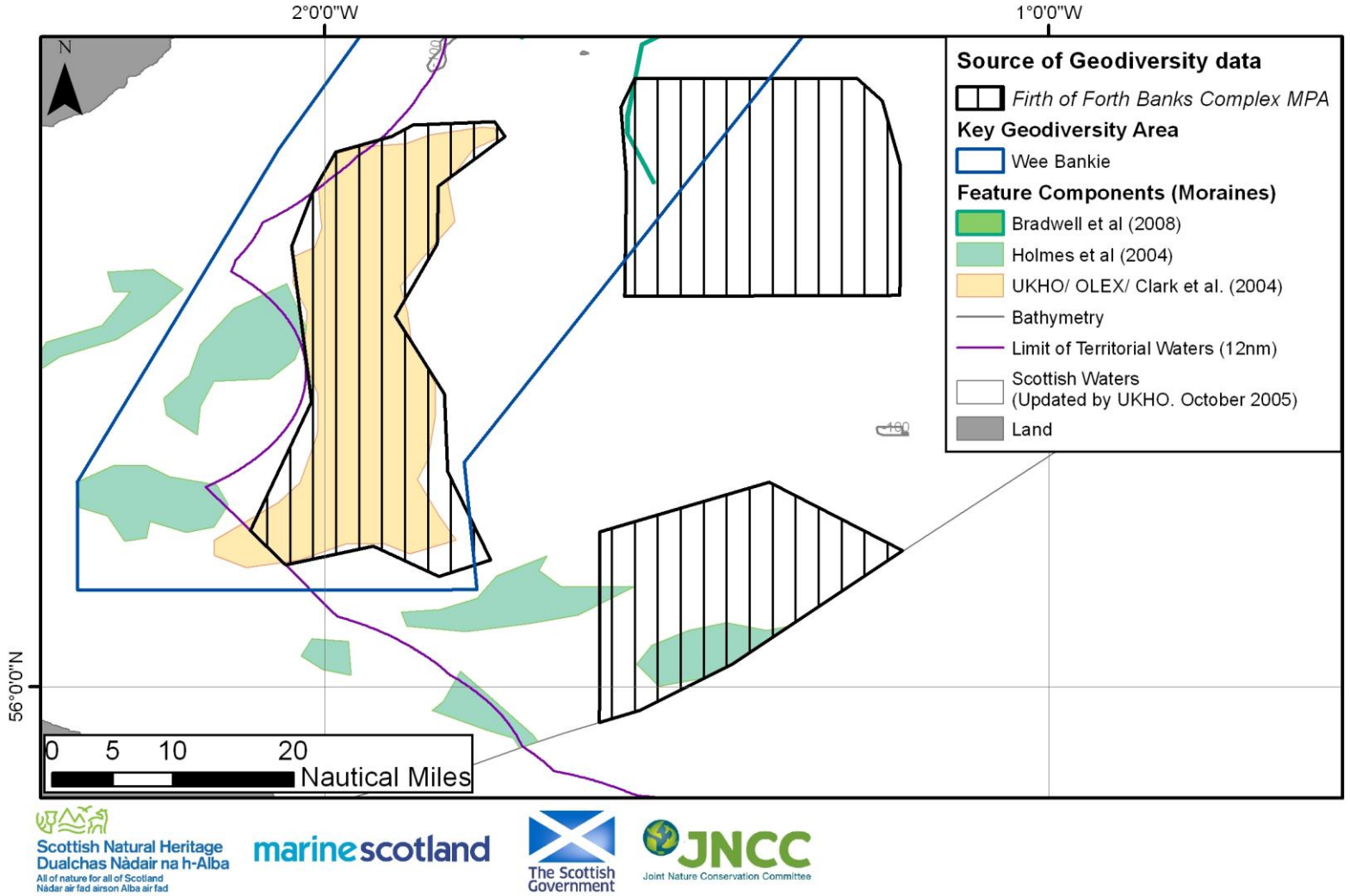

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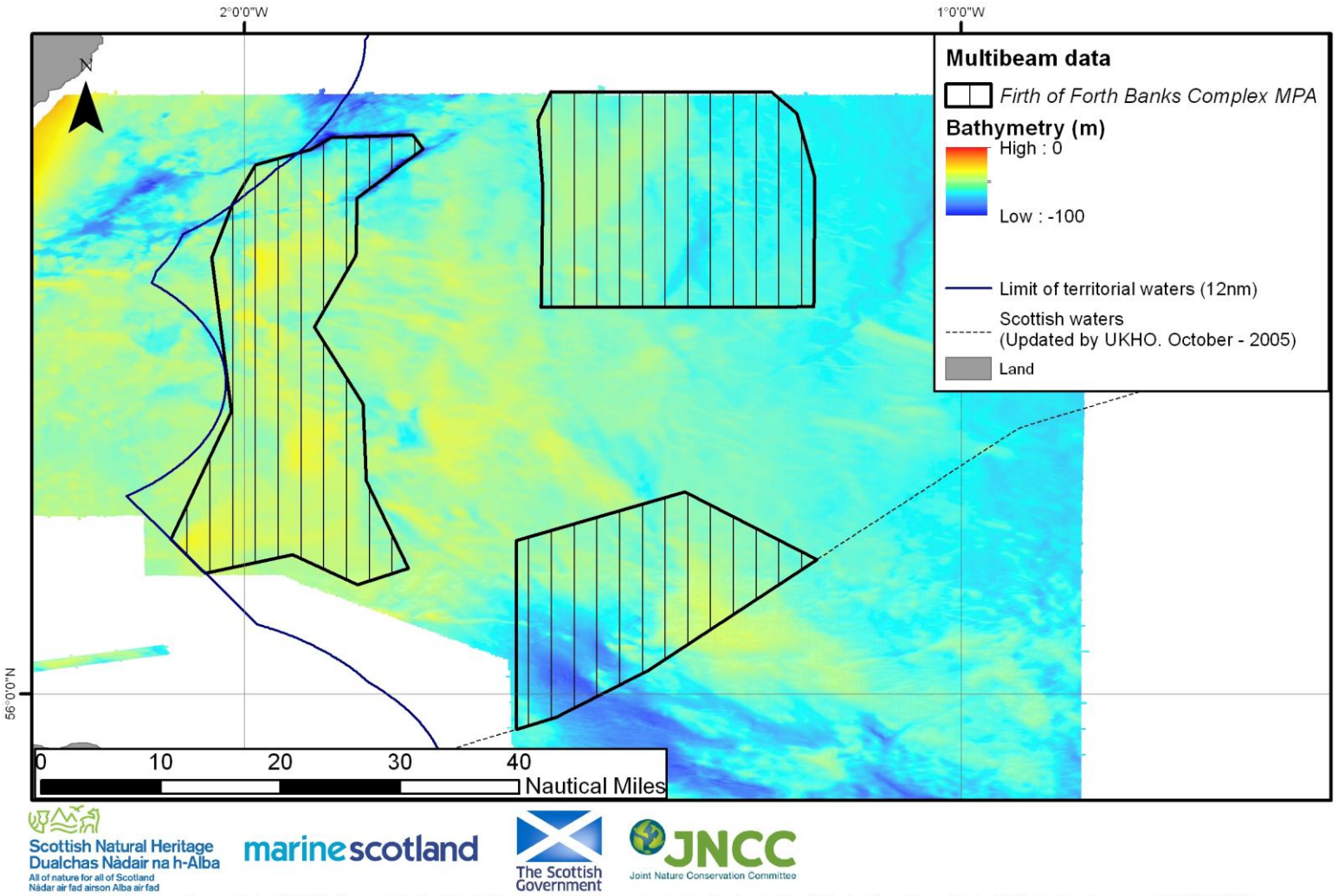

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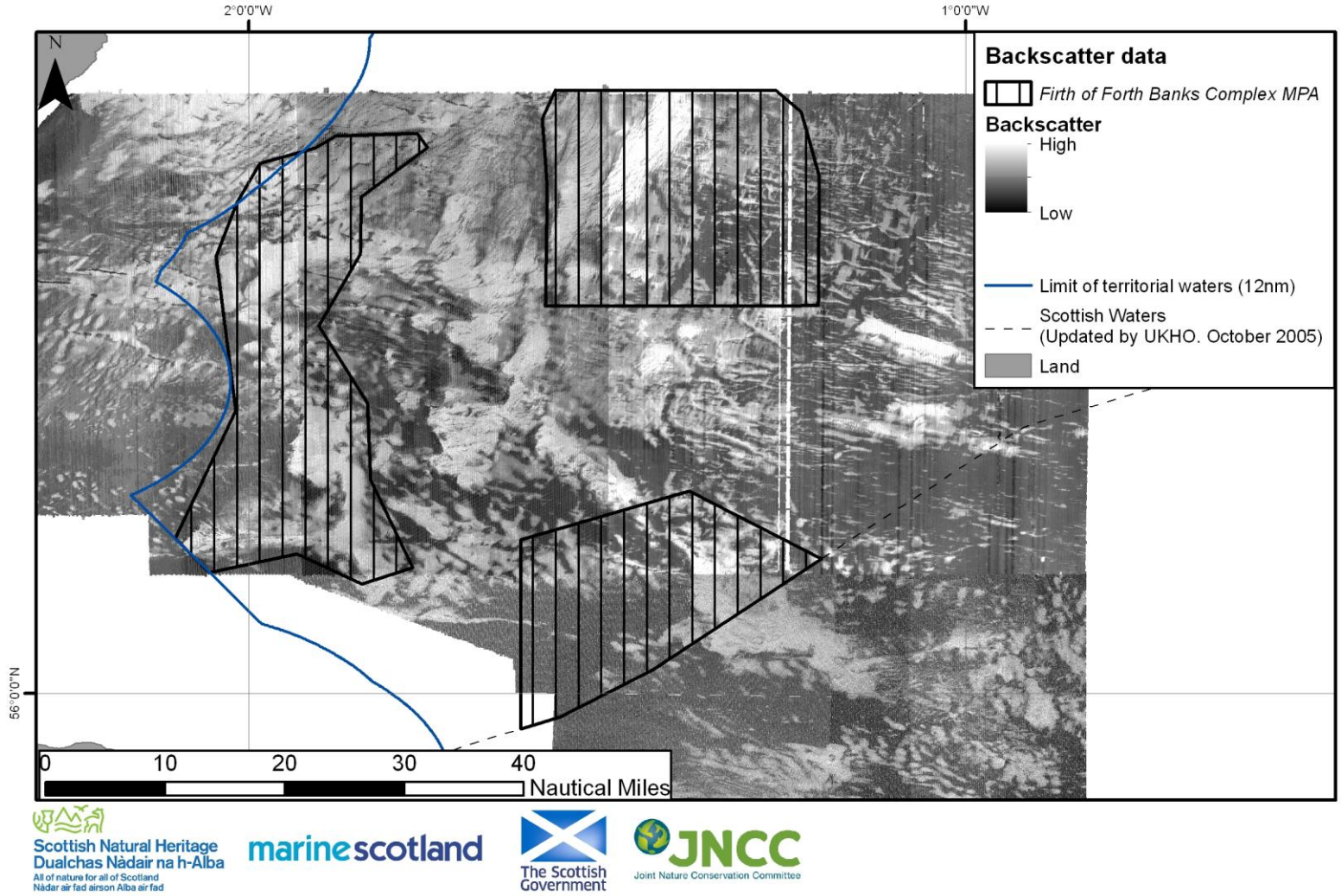

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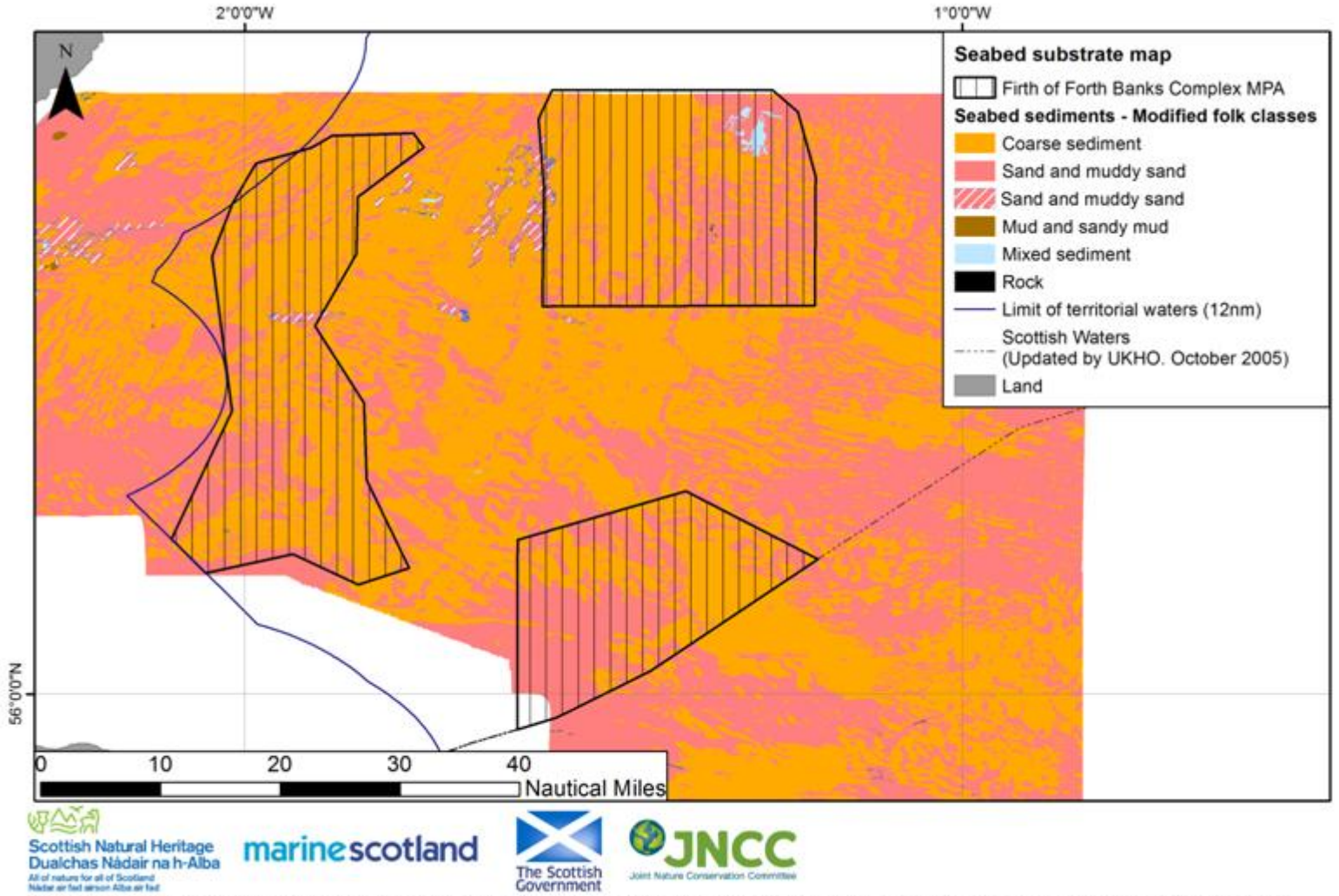
G

THE EVIDENCE BASE



Map displayed in geographic coordinates WGS84. The exact limits of the UK Continental Shelf are set out in the Continental Shelf (Designation of Areas) Order 2013, Statutory Instrument 2013/3162(© Crown Copyright). Landmass Ordnance Survey © Crown Copyright and database right 2011. All rights reserved. Scotland (Adjacent waters) Updated by the Law of the Sea Division, United Kingdom Hydrographic Office October 2005. MPA © JNCC and SNH 2014. All rights reserved. Seabed substrate data © MS, JNCC, NOC, BGS & SNH, 2011.

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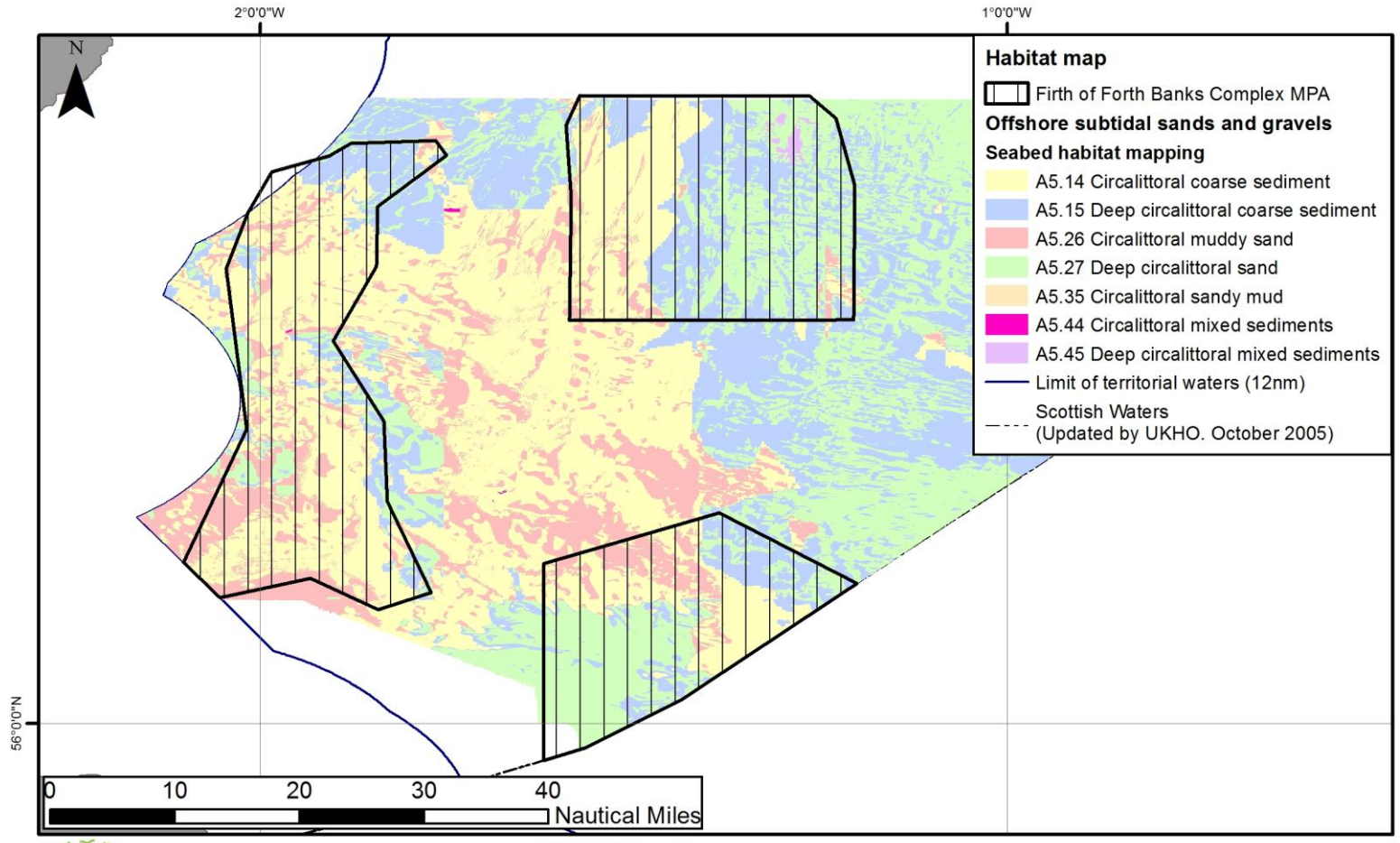
THE EVIDENCE BASE



Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

marinescotland

The Scottish Government

JNCC
Joint Nature Conservation Committee

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Data sources and bibliography		
Year	**Title**	**Features covered**
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