Joint Nature Conservation Committee

Scottish MPA Project
Data Confidence Assessments

FAROE-SHETLAND SPONGE BELT NATURE CONSERVATION MPA

JULY 2014

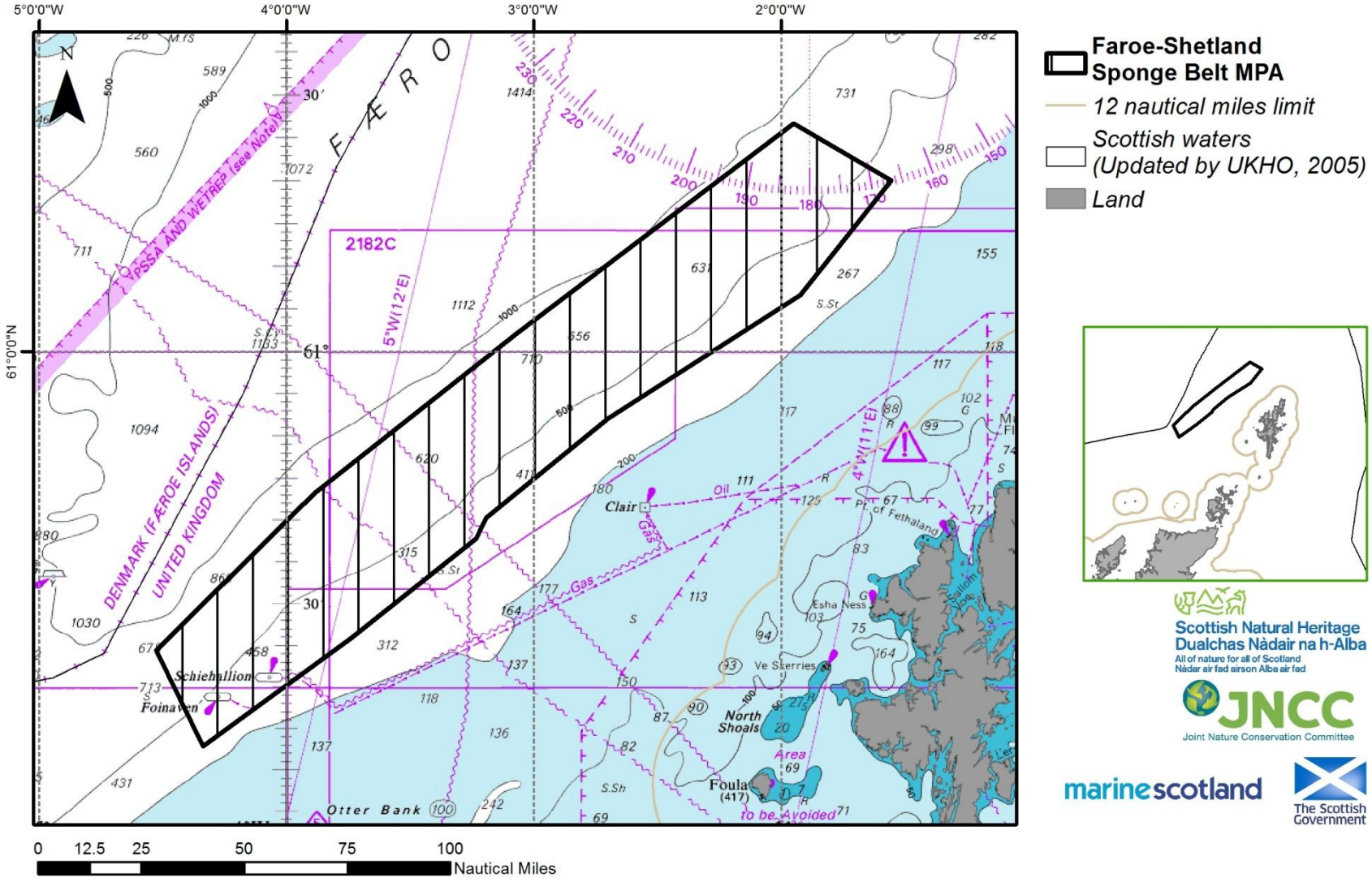
The following documents provide further information about the Faroe-Shetland Sponge Belt Marine Protected Area (MPA):

- 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-6479

Document Distribution List and Version Control				
Format	**Version**	**Issue date**	**Version development and review**	**Issued to**
Electronic	1.0	28/11/2012	Internal drafting and creation of version 1.0 for internal review.	Internal JNCC
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	11/07/2014	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 *The Faroe-Shetland Sponge Belt 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	Faroe-Shetland Sponge Belt	**Date of initial assessment**	22nd Aug 2012	**Assessors**	ALR, NC, PC, ML, OCA
The Faroe-Shetland sponge belt MPA will protect deep sea sponge aggregations, Atlantic and Arctic influenced offshore subtidal sands and gravels on the slope, ocean quahog (*Arctica islandica*) aggregations and an area of the continental slope. The MPA also includes geodiversity features representing the West Shetland Margin Paleo-Depositional System and West Shetland Margin Contourite Deposits key geodiversity areas (Brooks *et al.,* 2013). The area was selected following a consideration of least damaged/more natural locations (Faroe-Shetland Channel) as detailed in Chaniotis *et al.* (2011). The boundary has been drawn to focus on verified records of deep sea sponge aggregations and *Arctica islandica* aggregations, following the 400 and 800m isobaths as the area thought to contain the highest biological diversity in the channel.					

Protected features			
Biodiversity	Atlantic and Arctic influenced offshore subtidal sands and gravels (OSSG) on the slope Deep sea sponge aggregations (DSSA) Ocean quahog aggregations (*Arctica islandica*) (OQ) Continental slope (CS)	**Geodiversity**	Overlaps with key geodiversity areas – West Shetland Margin Paleo-Depositional System, West Shetland Margin Contourite Deposits Iceberg ploughmark fields and continental slope channels from the Quaternary of Scotland Block Slide deposits from the Submarine Mass Movement Block Sediment wave fields and sand wave fields from the Marine Geomorphology of the Scottish Deep Ocean Seabed Block (Brooks *et al.*, 2013)
Feature exclusions (MPA search features recorded within the MPA but excluded from the assessment with reasons)			
No features excluded			

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) Marine Particle Size Analysis (PSA) dataset (February 2012) - data collected between 1967 and 1987 categorised according to the Folk scheme and subsequently to the EUNIS habitat classification by JNCC based on the BGS modified Folk scheme • [2]Multibeam data collected during the 2006 SEA-SAC survey aboard the MV Franklin • [3]BGS interpretation of seabed sediments from multibeam/backscatter data (2006 MV Franklin SEA-SAC survey) • [4]EuSeaMap predictive habitat modelling project's habitat map (Cameron and Askew, 2011)

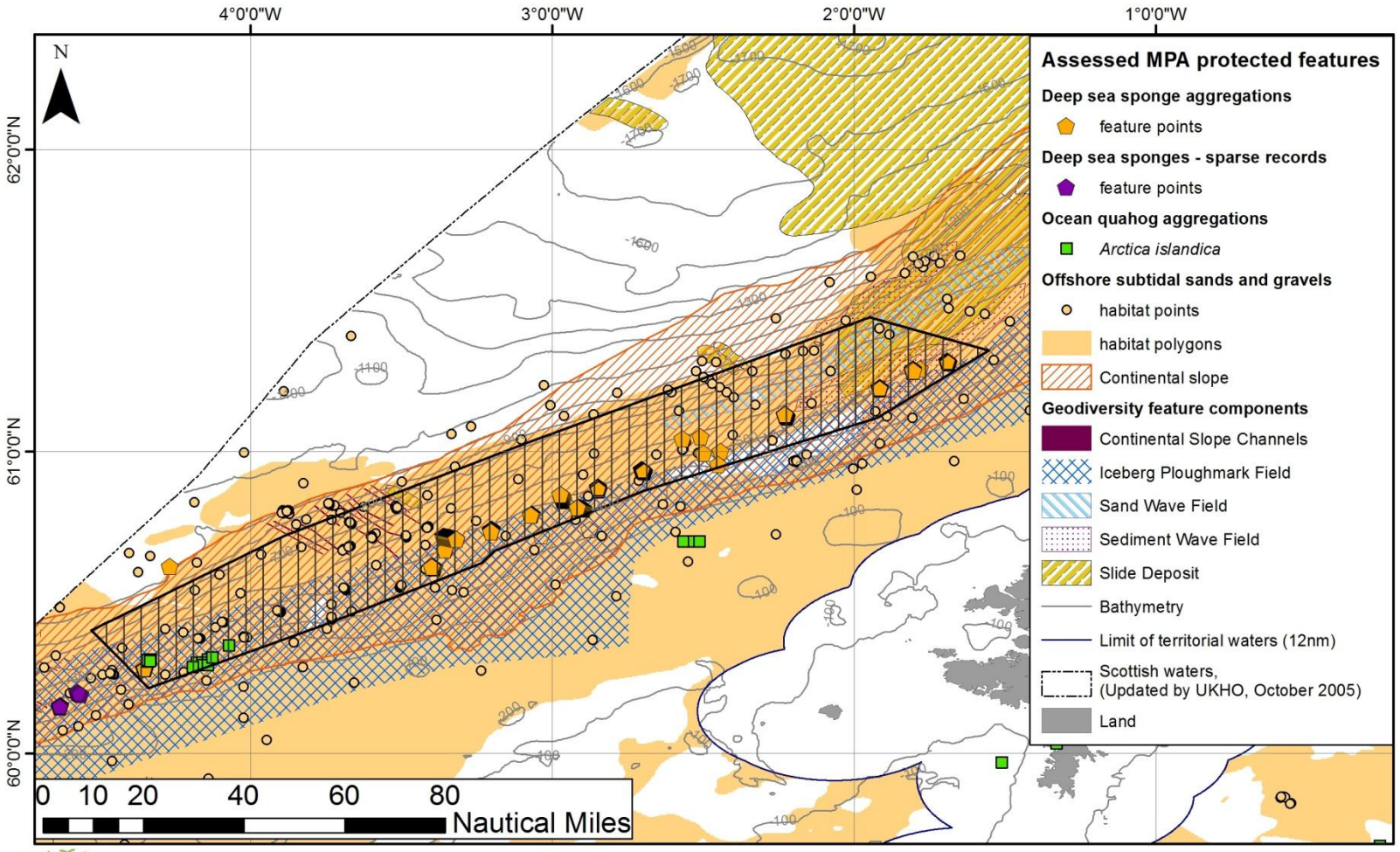
Summary of data confidence assessment (see detailed assessment on following pages)						
Confident in underpinning data	**Yes**	✓	**Partial**	**-**	**No**	**-**

Confident in presence of identified features?	✓ all features	**Data suitable to define extent of individual MPA search features**	**Yes**	**Partial**	**No**
			OSSG	DSSA CS	OQ

Summary	JNCC have high confidence in the presence and extent of the continental slope and offshore subtidal sands and gravels within the boundary, given the source, number, even distribution (when considered in combination) and age of the evidence available. Survey data provide good coverage of sample points on the slope across the MPA. The shape of the MPA was designed to represent the range of habitat biotopes described within this part of the SEA4 region. However, JNCC note that the sediment class assigned to approximately 20% (31 of 157) of the BGS PSA data points does not match the predicted offshore subtidal sands and gravels feature in the MPA. These inconsistencies are generally either isolated records or records located close to the predicted boundary between the sand and gravel feature and an adjacent area of mud. There will most likely be a gradual in change in sediment composition rather than the distinct class boundary between habitats [see McBreen *et al.,* (2011) and Cameron & Askew (2011) for further discussion on confidence in determining habitat boundaries]. Based on survey data from 2006, JNCC is confident in the presence of deep sea sponge aggregations in the central and north-eastern portions of the MPA boundary (Maps A-C). JNCC recognise this assumes that no significant disturbance of the feature has occurred in the intervening years since the survey. In addition, more recent data collected from stations evenly distributed along the 500m contour increases confidence in the presence and extent of deep sea sponge aggregations across the MPA boundary. The distribution of deep sea sponge aggregations in the north-east of the site is confirmed by 1996 AFEN data. Observations of large Demospongiae exceeding densities of 0.5 – 1 sponge/m^{-2}, meeting the OSPAR habitat definition (OSPAR Commission 2010), are located in the centre and the northern part of the MPA (Morris *et al.*, 2014). At either end of the MPA, records of deep sea sponge aggregations have been determined with lower certainty on account of marginally lower abundance of sponges. Beyond the south-west boundary of the MPA (Figure 2) there are observations of deep-

	sea sponges but the level of aggregation was considered sparse. These records, labelled as Deep sea sponges (sparse), are not considered to meet the feature definition and were used to set the extent of the site. They do however serve as indicators of the continuation of the presence of the characterising species beyond the MPA. JNCC has no information at the present time to explain the reduced densities in these observations. JNCC is confident ocean quahog is present in the MPA based on the findings of multiple surveys from 1998 to 2000 (Maps A-C). Given that ocean quahog are exceptionally long-lived (Ridgeway & Richardson, 2010), there is a high potential that the species continues to be present in the MPA, despite the age of the species records. JNCC recognise this assumes that no significant disturbance has occurred to the feature in the intervening years. Our knowledge of the feature's extent is limited to the survey design used to record the presence of ocean quahog. This means the sample data can only be used to provide a positive indication of feature presence; the sample design did not test for feature absence. Although ocean quahog is not characteristic of any particular habitat, it is known to occur in a range of sediment types 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 British Geological Survey PSA data[1], SEA4 sample data[2], UKSeaMap 2010 and EUSeaMap data to indicate the likely presence of potentially suitable habitat for ocean quahog aggregations as a proxy to define the extent of the feature.

Figure 2 The known distribution of protected features within the Faroe-Shetland Sponge Belt MPA



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

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). Scotland (Adjacent waters) Updated by the Law of the Sea Division, United Kingdom Hydrographic Office October 2005. Bathymetry © GEBCO, 2011. Bio data from Geodatabase of Marine features in Scotland (GeMS v4) © Crown copyright. MPA & geodiversity data © JNCC & SNH, 2014.

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	DSSA OSSG CS	**Multiple records collected pre 2000**	OQ DSSA OSSG
Comments	Our confidence in the presence and extent of offshore subtidal sands and gravels in the MPA is based on a wealth of data provided by three SEA4 surveys undertaken in the late 1990s and early 2000 (1996, 1998, and 2000), the MV Franklin SEA-SAC survey in 2006 and the more recent dedicated 2012 FRV Scotia survey - 1512S. The BGS sediment type dataset[1] collected between 1979 and 1987 also provided a vast array of data for offshore subtidal sands and gravels. The 2006 and more recent survey data collected in 2012 provided the majority of data on deep sea sponge aggregations, although a few records for this feature were available through analysis of the 1996 AFEN survey. Data for ocean quahog (*Arctica islandica*) aggregations were collected in 1998-2000. The polygon for the continental slope was digitised by specialists from the National Oceanography Centre (NOC) in 2009.		

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) – BGS PSA data, UKSeaMap2010 & EUSeaMap	✓
Comments	The majority of data for deep-sea sponge aggregations came from the analysis of video and still image data collected on the MV Franklin SEA survey in 2006 (Howell *et al.,* 2010), and data collected on 2012 FRV Scotia survey (1512S) (Morris *et al.*, 2014). The 1996 AFEN survey data provide additional records for this feature (in GeMS v4). Evidence for the presence and extent of offshore subtidal sands and gravels comes from the predictive seabed modelling project UKSeaMap 2010 (McBreen *et al.,* 2011). JNCC cross-checked these outputs against those from EUSeaMap, which updated the UKSeaMap 2010, and verified that the same components and extents of EUNIS Level 3 habitat types are still predicted to be present within the site boundary (Cameron and Askew, 2011). Ground-truthing data for offshore subtidal sands and gravels were collected by a number of different surveys. Biotope identification and characterisation was undertaken by NOC (Bett, 2012) using data from surveys carried out in the SEA4 area between 1996 and 2000. The first two surveys (1996 and 1998) were undertaken on behalf of AFEN (Atlantic Frontier Environmental Network), a consortium of oil companies, UK government environmental advisers (JNCC, FRS) and the UK Department for Trade and Industry (DTI, offshore programme of work now managed by the Department of Energy and Climate Change (DECC)). Further data came from a survey in 2000 carried out as part of DECC's Strategic Environmental Assessment (SEA) process. Data were also generated through Plymouth University's analysis of the video and stills images collected on the 2006 SEA survey on the MV Franklin (in GeMS v4). PSA data was sourced from the British Geological Survey (BGS)[1]. Data for ocean quahog (*Arctica islandica*) aggregations were collected by surveys for British Petroleum in 1998 to 2000. The polygon for the continental slope was digitised by specialists from the National Oceanography Centre (NOC) as part of work completed for Department of Environment, Food and Rural Affairs (Defra) in support of the national MPA projects to further a deep-sea habitat classification scheme (Jacobs, C. & Porritt, L., 2009). The feature was digitised using the GEBCO digital atlas (http://www.gebco.net/) and other acoustic survey datasets (TOBI sidescan, multibeam bathymetry and backscatter).This polygon is part of the physiographic feature dataset that fed into the SNH-JNCC contract to characterise and identify Key Geodiversity Areas in Scottish waters (Brooks *et al.*, 2013).				

Sampling methods / resolution							
Feature	**Modelled**	**Acoustic / remote sensing**	**Remote video / camera**	**Infaunal - grab / core**	**Fisheries trawl**	**Diving**	**Sediment sampling**
OSSG	✓	✓	✓	✓	✓		✓
DSSA		✓	✓		✓		
CS	✓	✓					
OQ				✓			
Comments	Data for offshore subtidal sands and gravels are available mainly from infaunal samples collected using benthic grab samplers from AFEN/SEA surveys in 1996, 1998 and 2000. The National Oceanography Centre characterised the offshore subtidal sand and gravel habitats using the samples collected during the 1996-2000 surveys. Photographic imagery from the 2006 SEA-SAC survey was used by Plymouth University to map the presence of deep sea sponge aggregations (in GeMS v4). The 2012 FRV Scotia survey (1512S) in the Faroe-Shetland Channel (in GeMS v4) used towed video equipment to survey the slope. Photographic imagery was collected during the survey using an Insite Pegasus 1366 standard definition colour camera and a standard definition stills camera mounted on a drop-frame, downward facing. Records of ocean (*Arctica islandica*) aggregations are sourced from benthic grab sample surveys for British Petroleum. The predicted habitat map from UKSeaMap 2010 used in this assessment was developed by JNCC. The predicted habitat map from EUSeaMap 2011 was developed by a consortium of European partners led by JNCC (Cameron and Askew, 2011). Grab and core samples were taken during surveys conducted by the BGS and the PSA results underpin the predicted habitat map. JNCC acknowledge that the spatial accuracy of older PSA records may be limited by modern standards where the Decca Main Chain or similar types of positioning systems were used.						

Data coverage (Maps A to H)					
Across the MPA					
Numerous protected feature records evenly distributed across the 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 the MPA?	OSSG DSSA	**Few or scattered records of specific protected features making extent and broad distribution assessment difficult?**	-	**Few or isolated records of specific protected feature records**	OQ

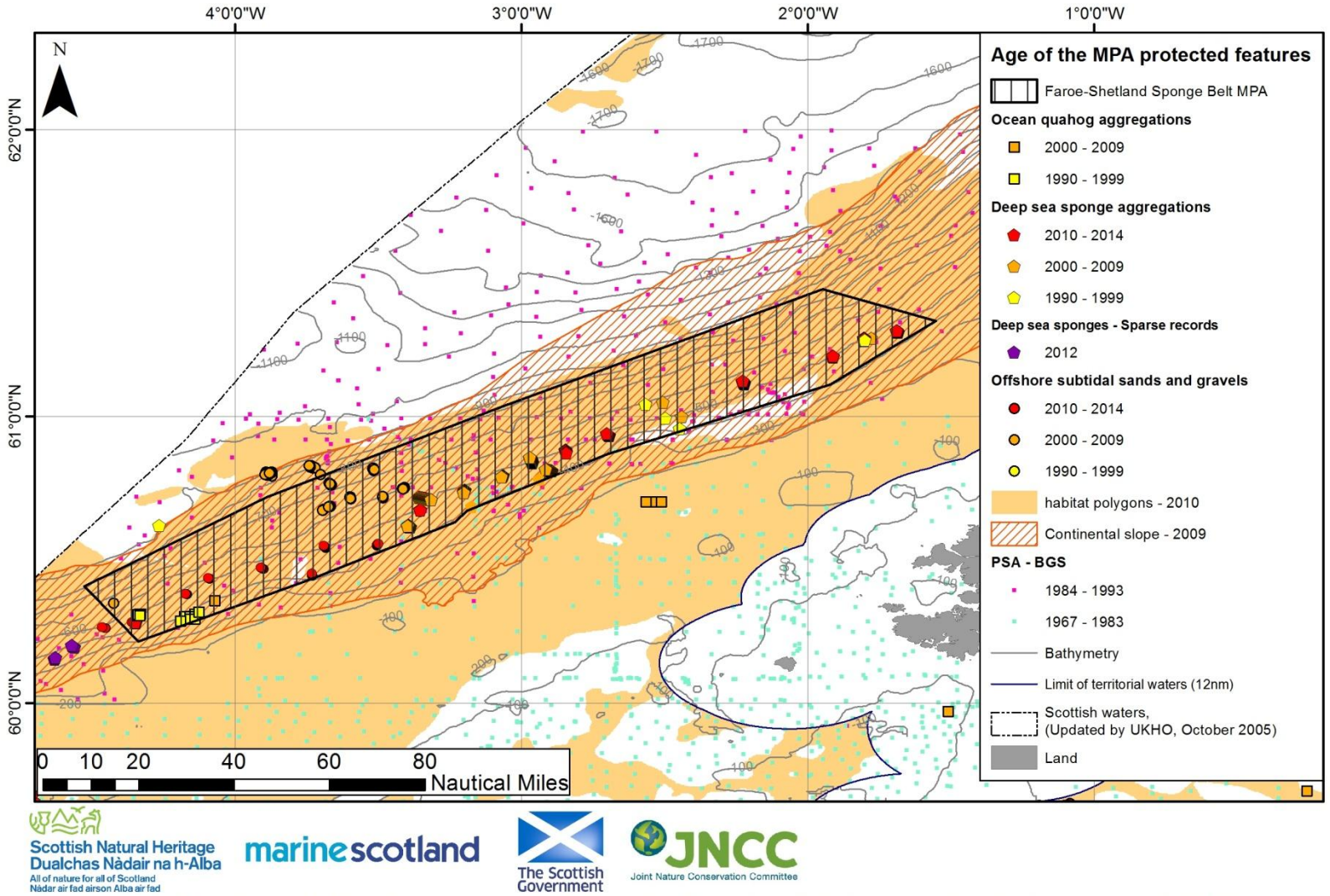
Data coverage (Maps A to H)	
Are acoustic remote sensing data available to facilitate the development of a full coverage predictive seabed habitat map?	No, there is only partial coverage of multibeam data from the 2006 MV Franklin SEA-SAC survey (Map G that BGS interpreted to map the sediment type (Map H). Further data are anticipated from the 2012 FRV Scotia survey (1512S) of Wyville-Thompson Ridge and the Faroe-Shetland Channel that collected sidescan sonar data in the MPA.
Comments	**Continental slope (CS)** • Major Cenozoic Structures SNH-JNCC contract to characterise and identify Key Geodiversity Areas in Scottish waters (Brooks *et al.*, 2013) - The polygon for the continental slope was digitised by specialists from the National Oceanography Centre (NOC) as part of work completed for Defra in support of the national MPA projects to further a deep-sea habitat classification scheme (Jacobs, C. & Porritt, L., 2009). The feature was digitised from the GEBCO digital atlas (http://www.gebco.net/) and other acoustic survey datasets (TOBI sidescan, multibeam bathymetry and backscatter). The upper slope edge of this dataset aligns with the general habitat classification principles (i.e. limit of the deep/offshore circalittoral biological zone) that were used in predictive mapping of the UKSeaMap 2010 and EUSeaMap projects, and therefore provides spatial agreement with the broad-scale habitat data used to predict the extent of features. **Atlantic and Arctic influenced offshore subtidal sands and gravels (OSSG) on the slope** • UKSeaMap 2010 (in GeMS v4) - The habitat map predicts that offshore subtidal sands and gravel habitats occur across the MPA (comprising ~97% of the total area). More specifically, the following habitats are predicted to occur: Arctic slope coarse sediment, Arctic slope mixed sediment, Arctic slope sand and muddy sand, Arctic upper bathyal coarse sediment, Arctic upper bathyal mixed sediment, Arctic upper bathyal sand and muddy sand, Atlantic slope coarse sediment, Atlantic slope mixed sediment and Atlantic slope sand and muddy sand. • EUSeaMap (Cameron and Askew, 2011) – JNCC checked whether the more recent EUSeaMap habitat model has significantly changed the previous predicted distribution of habitats from UKSeaMap 2010. Note that the Atlantic and Arctic biogeographic regions which UKSeaMap 2010 incorporates are not a parameter of the EUSeaMap model. Therefore when comparing the two models JNCC incorporated these biogeographic regions into the EUSeaMap model to assess the differentiation of habitats. Improved bathymetry datasets in EUSeaMap meant there was a minor alteration to the biological zone boundaries. In the deep-sea, the implications for OSSG were that there was a change in the extent of upper-bathyal coarse, mixed and sand sediment habitats predicted, increasing the area predicted for those habitats in the slope biological zone. The UKSeaMap and EUSeaMap models used the same substrate input layer (for UK waters), although the EUSeaMap project used these data at a reduced spatial resolution. As the substrate type is a key driver in determining the distribution of offshore subtidal sand and gravel habitat Maps A, B and C reflect the finer resolution UKSeaMap2010 data. • [1]British Geological Survey (BGS) Particle Size Analysis (PSA) dataset (February 2012) - These data represent sediment sampling between 1967 and 1987 across the UK waters in which the PSA results were categorised according to the Folk scheme and subsequently to the EUNIS habitat classification [by JNCC] based on the BGS modified Folk scheme. Note these data underpin the BGS substrate map used in the seabed habitat modelling projects UKSeaMap 2010 & EUSeaMap 2011. Of the 150 sediment samples collected by the BGS (between 1979 and 1987) within the predicted extent of the offshore subtidal sands and gravel habitats, 8 record the presence of the modified Folk class/EUNIS ‘sand and muddy sand’, 88 record the presence of ‘mixed

Data coverage (Maps A to H)	
	sediments' and 34 record the presence of 'coarse sediment' and are evenly distributed within the extent of the predicted offshore subtidal sands and gravels within the MPA. 20% (31 of 157) of the data points in the MPA record 'mud and sandy mud' that is not a Folk class considered part of the OSSG feature. These inconsistencies are the result of isolated records together with records occurring relatively close to the predicted boundary between the sand and gravel feature and an adjacent area of mud habitat. This apparent disagreement reflects the gradual change in sediment composition rather than a distinct boundary between habitat classes. • JNCC note there are further BGS records for the modified Folk class/EUNIS 'coarse sediment', 'mixed sediment', 'sand and muddy sand' (in addition to 'mud and sandy mud') within the areas predicted to be offshore deep sea muds, suggesting that the predicted boundary between this feature and the offshore subtidal coarse sediments is uncertain (see McBreen *et al.,* (2011) and Cameron & Askew (2011) for further discussion on confidence in determining habitat boundaries). • MoA between JNCC, UoP, BGS, NOC & SAMS concerning the PhD entitled "Identification of areas of nature conservation importance in deep waters of the UK continental shelf, to contribute towards spatial planning and the development of an ecologically coherent network of MPAs in the North-East Atlantic" project (referred to in Map B as: 2006 MVFranklin SEA-SAC survey) (in GeMS v4) – There are seven clusters of survey data points from an SEA survey commissioned by DECC in 2006 that record the presence of offshore subtidal sands and gravels on the slope in the central area of the MPA. All points intersect with the predicted extent of offshore subtidal sands and gravel habitats. • BGS interpretation of seabed sediments from multibeam/backscatter data (2006 MV Franklin SEA-SAC survey) – BGS mapped mixed, coarse and sand sediments through expert interpretation of the block of multibeam and backscatter data from the 2006 survey (Map H). This work was completed through the above mentioned MoA. • NOC biotope analysis of SEA4 AFEN and DTI data (Bett, 2012) (referred to in Map B as: NOC SEA4, and presented in Map D) (GeMS v4) - There are multiple records from the benthic sampling element of three multidisciplinary surveys conducted between 1996 and 2000 that are scattered across the MPA. Bett (2012) described the SEA4 region as being portioned into eight primary (proposed) biotopes. Six are sand and muddy sand biotopes, two of these are represented within the Faroe-Shetland sponge belt area: Spionidae-Capitellidae-Syllidae in Atlanto-Arctic sand and muddy sand (300-600m), Cirratulidae-Maldanidae-Maldanidae in Arctic sand and muddy sand (600-1200m). One of the records overlaps with an area predicted to be offshore deep sea muds by UKSeaMap 2010 but is located within <0.5km distance from the predicted boundary of an offshore subtidal sands and gravels area; noting the likely lower positional accuracy of the sampling device on the seabed compared to the ship, combined with the coarse resolution of the map, this point should be considered further confirmation of the feature's presence in that area. The remaining points intersect with the predicted extent of offshore subtidal sands and gravel habitats. There is one record which identified offshore deep sea muds on the slope, in the central/northern region of the boundary. This point lies in an area predicted to be offshore subtidal sands and gravels but probably reflects the patchiness of the habitat regime through the MPA. • 2012 FRV Scotia survey (1512S) of the Wyville-Thompson Ridge and the Faroe-Shetland Sponge Belt (Morris *et al.*, 2014) (in GeMS v4) – There are 15 survey stations where photographic images were captured that provide evidence of the presence of offshore subtidal sands and gravels. The stations were dominated by bathyal coarse sediments, in places giving way to areas of mixed sediments with occasional cobbles and pebbles. The stations in the north-east and south west of the MPA were particularly characterised by mosaics of coarse/mixed sediments and cobbles.

Data coverage (Maps A to H)	
	Deep sea sponge aggregations (DSSA) • 1996 AFEN Survey of the SEA4 Region (in GeMS v4) – There are three records from an AFEN survey in 1996 that show deep sea sponge aggregations in the north-eastern area of the MPA. One of these records was part of a subset of data verified by Henry and Roberts (2014) as meeting the OSPAR definition of deep sea sponge aggregations. • MoA between JNCC, UoP, BGS, NOC & SAMS concerning the PhD entitled "Identification of areas of nature conservation importance in deep waters of the UK continental shelf, to contribute towards spatial planning and the development of an ecologically coherent network of MPAs in the North-East Atlantic" project (referred to in Map B as: 2006 MVFranklin SEA-SAC survey) (in GeMS v4) – There are six clusters of data points from the SEA survey in 2006 analysed by Plymouth University for JNCC that record the presence of deep sea sponge aggregations in the central area of the MPA. All records in GeMS are determined as 'certain'. This sponge feature is reported as being centred around the 500m contour within the Faroe-Shetland Channel in a region where temperature was observed to fluctuate from below 0 to more than 7.8°C (Howell *et. al*., 2010). • 2012 FRV Scotia survey (1512S) of the Wyville-Thompson Ridge and the Faroe-Shetland Sponge Belt (Morris *et al.*, 2014) (in GeMS v4) – There are multiple survey stations where photographic images were captured to provide evidence of deep sea sponge aggregations across the MPA. Sampling concentrated along the length of the MPA area proposed at the time. Large Demospongiae exceeding densities of 0.5 – 1 sponge/m^{-2}, meeting the OSPAR habitat definition (OSPAR Commission 2010), were recorded by images from stations located in the centre and the northern part of the MPA. Records of deep sea sponge aggregations with a lower certainty are located toward the extremities of the MPA. Beyond the south-west boundary (Figure 2, Map A-C), there are observations of deep-sea sponges but the level of aggregation was judged sparse. These records, labelled in the data maps as Deep sea sponges (sparse) are not considered to meet the feature definition but were used when establishing the south-west boundary of the site. **Ocean quahog (*Arctica islandica*) aggregations (OQ)** • 1998 - ERT - Foinaven BP (in GeMS v4) – There is a cluster of 6 records of ocean quahog (*Arctica islandica*) presence within the south-west area of the MPA. • 1999 - ERT - Foinaven BP (in GeMS v4) – There are 2 records of ocean quahog (*Arctica islandica*) presence in the south-west of the MPA from this survey • 1999 - ERT - East Foinaven BP (in GeMS v4) - There are 8 records of ocean quahog (*Arctica islandica*) presence in the south-west of the MPA from this survey • 2000 - ERT - Schiehallion BP (in GeMS v4) - There is a record of ocean quahog (*Arctica islandica*) presence in the south-west of the MPA from this survey • The predictive habitat modelling products and BGS PSA data discussed above under OSSG confirm that there is suitable habitat for colonisation by Ocean quahog occurs throughout the MPA area. **Geodiversity** Geodiversity features representing key geodiversity areas in Scotland's seas are distributed across the majority of the MPA (Map E & F). In the east of the MPA there are sediment wave fields and sand wave fields from the Marine Geomorphology of the Scottish Deep Ocean

Data coverage (Maps A to H)	
	Seabed block and slide deposits from the Submarine Mass Movement block. These features are representative of the West Shetland Margin Contourite Deposits key geodiversity area. In the west of the possible MPA there are iceberg ploughmark fields and continental slope channels from the Quaternary of Scotland block. These features are representative of the West Shetland Margin Palaeo-Depositional System key geodiversity area (Brooks *et al.*, 2013). These iceberg ploughmarks can be seen in the TOBI sidescan data collected during the AFEN and DTI surveys of 1996 and 2000.

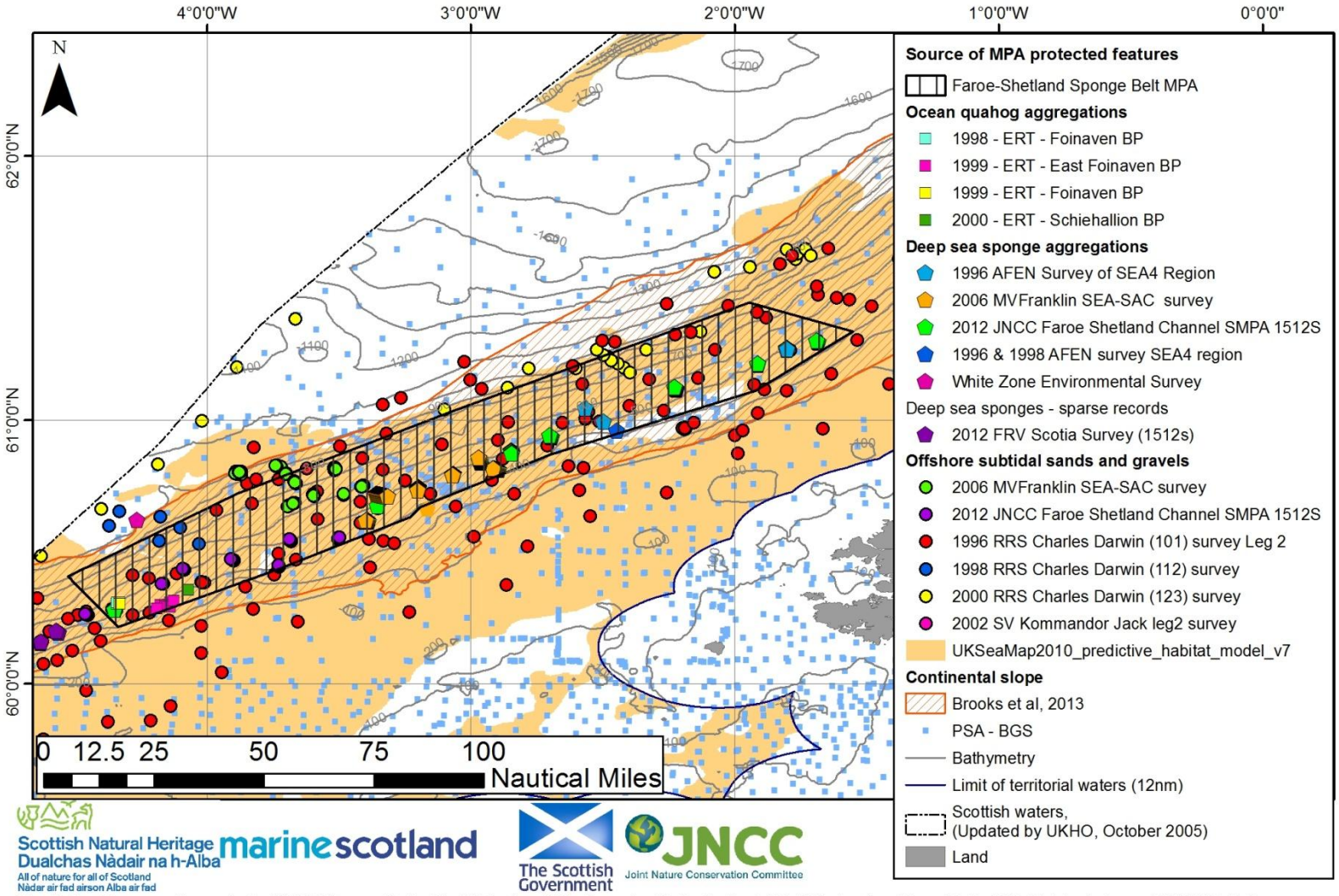
THE EVIDENCE BASE



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). Scotland (Adjacent waters) Updated by the Law of the Sea Division, United Kingdom Hydrographic Office October 2005. Bathymetry © GEBCO, 2011. Bio data from Geodatabase of Marine features in Scotland (GeMS v4) © Crown copyright. MPA & geodiversity data © JNCC & SNH, 2014. PSA data © BGS.

A

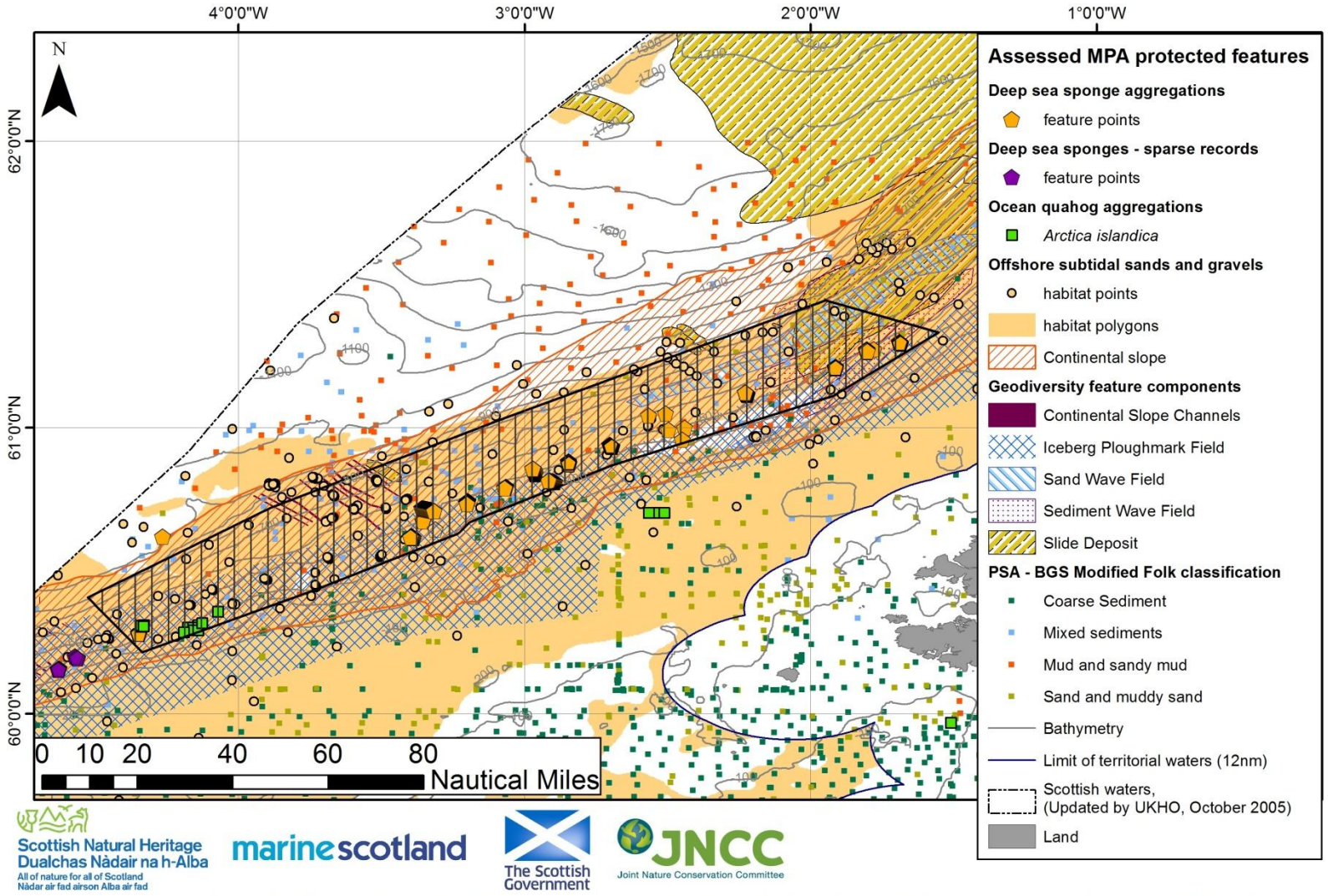
THE EVIDENCE BASE



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). Scotland (Adjacent waters) Updated by the Law of the Sea Division, United Kingdom Hydrographic Office October 2005. Bathymetry © GEBCO, 2011. Bio data from Geodatabase of Marine features in Scotland (GeMS v4) © Crown copyright. MPA data © JNCC & SNH, 2014. PSA data © BGS.

B

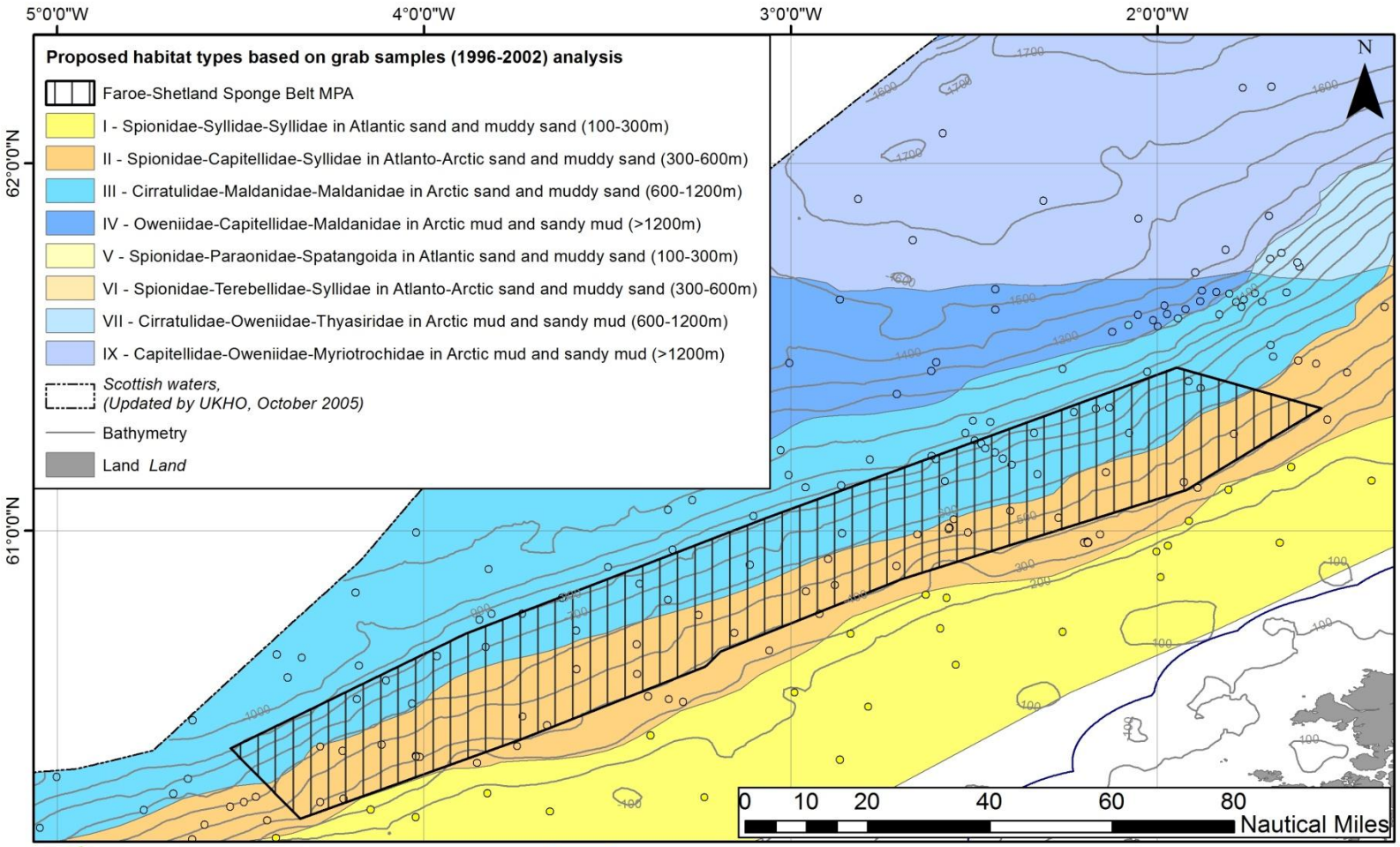
THE EVIDENCE BASE



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). Scotland (Adjacent waters) Updated by the Law of the Sea Division, United Kingdom Hydrographic Office October 2005. Bathymetry © GEBCO, 2011. Bio data from Geodatabase of Marine features in Scotland (GeMS v4) © Crown copyright. MPA & geodiversity data © JNCC & SNH, 2014.

C

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

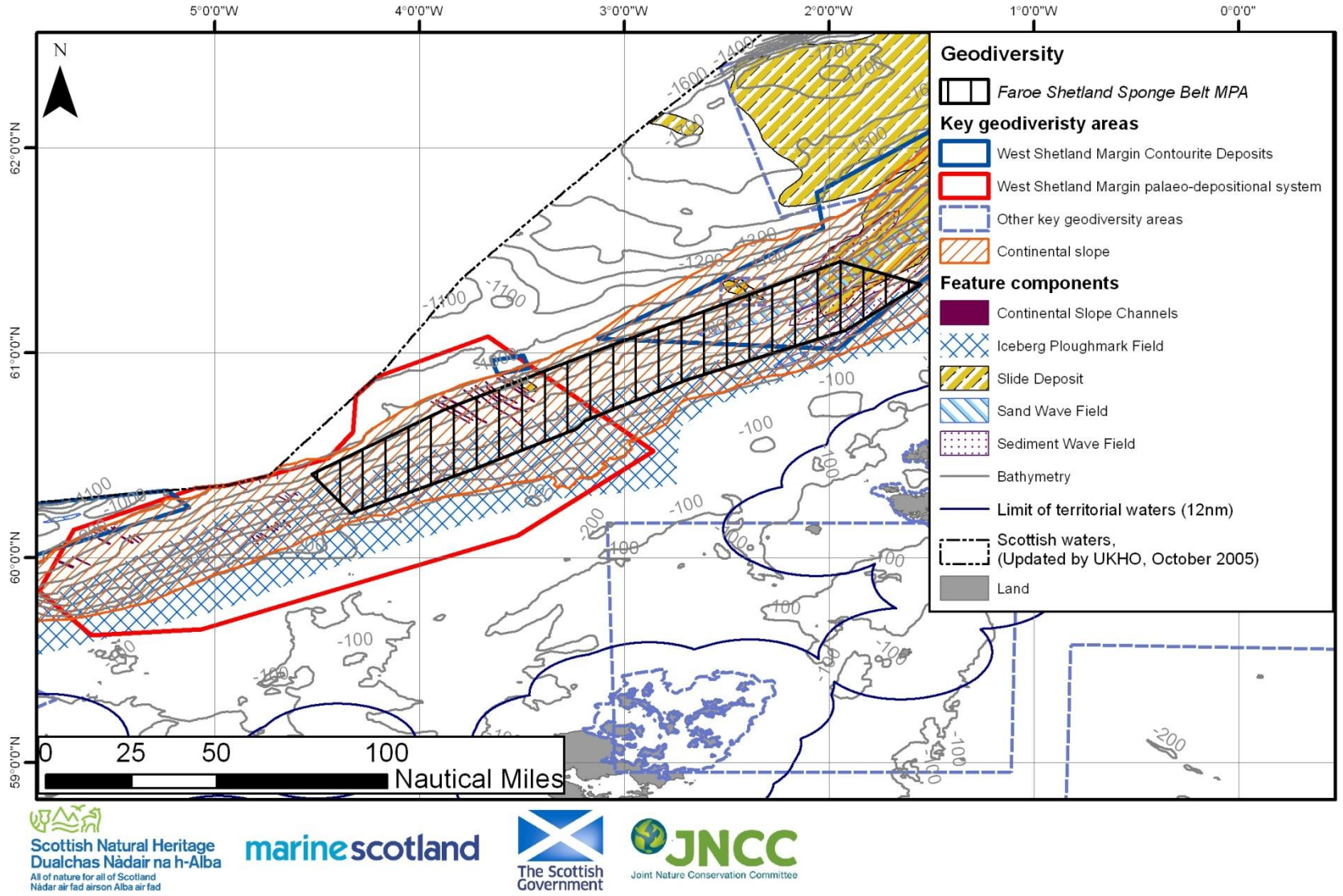
marinescotland

The Scottish Government

JNCC
Joint Nature Conservation Committee

D

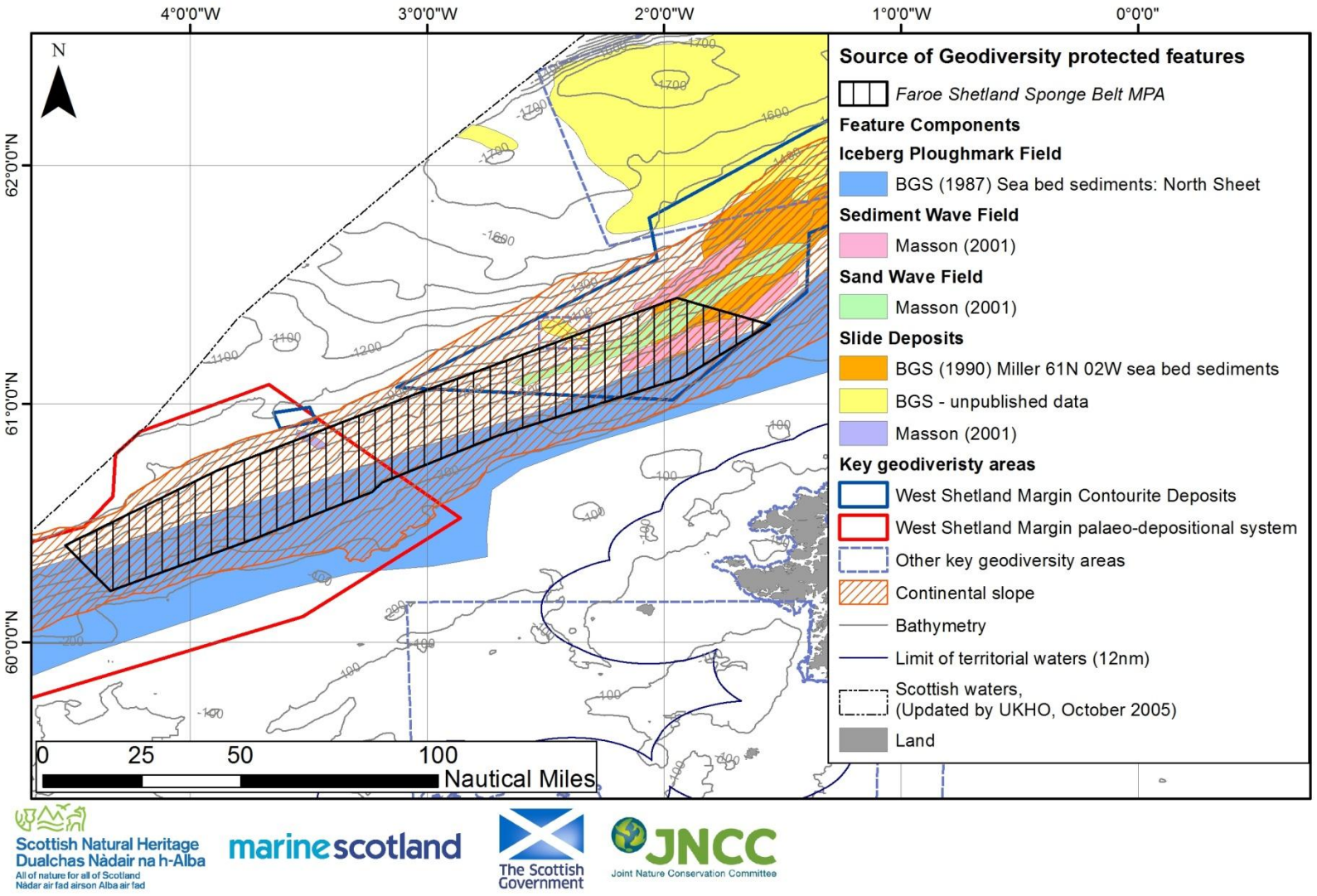
THE EVIDENCE BASE



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). Scotland (Adjacent waters) Updated by the Law of the Sea Division, United Kingdom Hydrographic Office October 2005. Bathymetry © GEBCO, 2011. MPA & geodiversity data © JNCC & SNH, 2014.

E

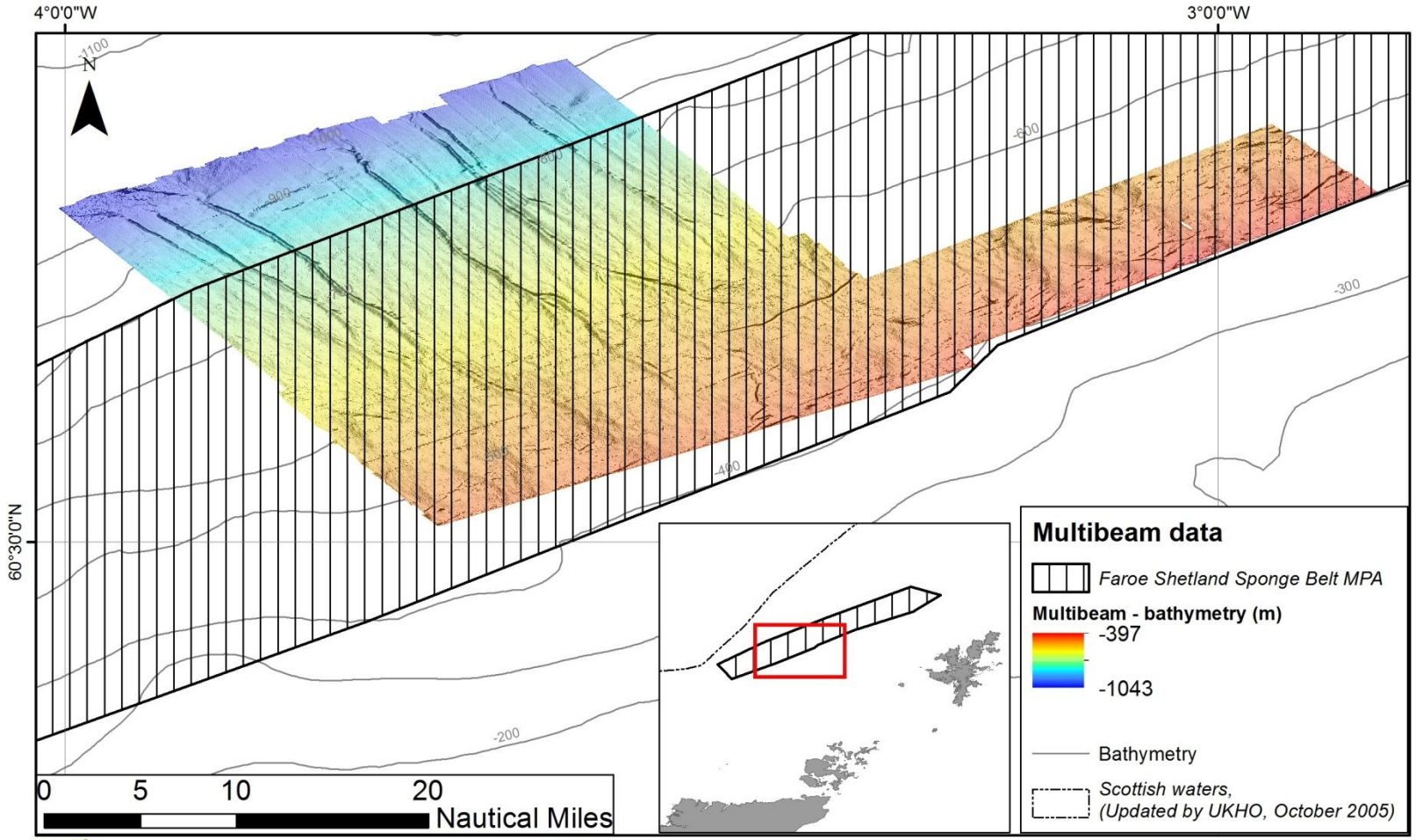
THE EVIDENCE BASE



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). Scotland (Adjacent waters) Updated by the Law of the Sea Division, United Kingdom Hydrographic Office October 2005. Bathymetry © GEBCO, 2011. MPA & geodiversity data © JNCC & SNH, 2014.

F

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

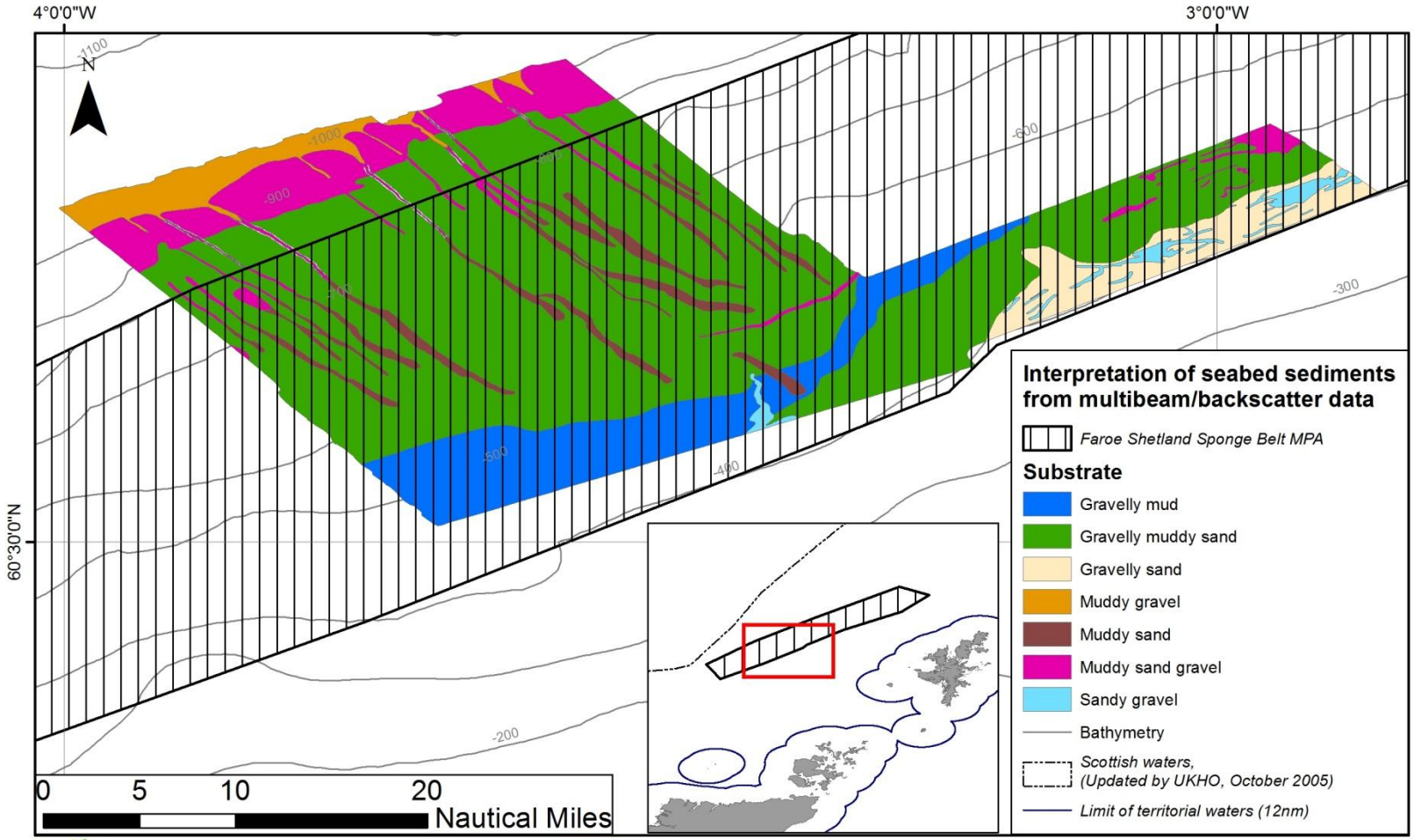
marinescotland

The Scottish Government

JNCC
Joint Nature Conservation Committee

G

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

Map displayed in geographic coordinates WGS84. The exact limits of the UK Continental Shelf are set out in orders made under section 1(7) of the Continental Shelf Act 1964 (© Crown Copyright).
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. MPA data © JNCC and SNH, 2014. All rights reserved. Substrate data @ JNCC, UoP, BGS, NOC & SAMS - MoA concerning UoP PhD.

H

Data sources and bibliography		
Year	**Title**	**Features covered**
2014	Morris, E.S., Stamp, T. & Goudge, H. (2014) Analysis of video and still images to characterise habitats and macrobenthos of the Wyville Thomson Ridge SCI and Faroe-Shetland Sponge Belt Scottish Nature Conservation MPA Proposal (1512S). JNCC Report 532.	DSSA, OSSG
2014	Geodatabase of Marine features in Scotland (GeMS) Version 4	OSSG, OQ, DSSA
2014	Henry, L-A & Roberts, M. (2014). Applying the OSPAR habitat definition of deep-sea sponge aggregations to verify suspected records of the habitat in UK waters. JNCC Report 508.	DSSA
2013	Brooks, A.J., Kenyon, N.H., Leslie, A., Long., D. and Gordon, J.E. (2013). Characterising Scotland's marine environment to define search locations for new Marine Protected Areas. Part 2: The identification of Key Geodiversity Areas in Scottish waters. Scottish Natural Heritage Commissioned Report No. 432	CS, Geodiversity
2012	Bett, B.J., 2012. Seafloor biotope analysis of the deep waters of the SEA4 region of Scotland's seas. *A report for the Joint Nature Conservation Committee*, JNCC Report 472, 99 pages.	OSSG
2011	Cameron, A. and Askew, N. (eds.). (2011). EUSeaMap - Preparatory Action for development and assessment of a European broad-scale seabed habitat map final report. Available at http://jncc.gov.uk/euseamap	OSSG
2011	Chaniotis, P.D., Crawford-Avis, O.T., Cunningham, S., Gillham, K., Tobin, D., Linwood, M., 2011. *Profiles of locations considered to be least damaged/more natural in Scotland's seas*. Supplementary report produced by the Joint Nature Conservation Committee, Scottish Natural Heritage and Marine Scotland for the Scottish Marine Protected Areas Project. Available from <http://www.scotland.gov.uk/Resource/Doc/295194/0121829.pdf>	-
2011	McBreen, F., Askew, N., Cameron, A., Connor, D., Ellwood, H., Carter, A., (2011), UK SeaMap 2010 Predictive mapping of seabed habitats in UK waters, JNCC Report 446, ISBN 0963 8091	OSSG
2010	Howell, K., Davies, J., Narayanaswamy, B. (2010) *Identifying deep-sea megafaunal epibenthic assemblages for use in habitat mapping and marine protected area network design.* Journal of the Marine Biological Association of the United Kingdom, page 1 of 36.	DSSA
2009	Jacobs, C. and Porritt, L., 2009. Deep sea habitats - contributing towards completion of a deep-sea habitat classification scheme, NOCS Research and Consultancy Report No.62	CS

Data sources and bibliography		
Year	**Title**	**Features covered**
2008	Sabatini, M. & Pizzolla, P. 2008. *Arctica islandica*. Icelandic cyprine. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 07/06/2010]. Available from: http://www.marlin.ac.uk/speciesinformation.php?speciesID=2588	OQ
2007	Howell, K.L., Davies, J.S., Hughes, D.J. & Narayanaswamy, B.E., 2007. SEA/SAC Survey 2007. Photographic analysis report. DTI.	-
2006	Connor, D.W., Gilliland, P.M., Golding, N, Robinson, P.,Todd, D., & Verling, E. (2006). *UKSeaMap: the mapping of seabed and water column features of UK seas.* Joint Nature Conservation Committee, Peterborough. ISBN 86107 590 1	-
2003	Witbaard, R. & Bergman, M.J.N. 2003. The distribution and population structure of the bivalve *Arctica islandica* L. In the North Sea: what possible factors are involved? *Journal of Sea Research,* 50(1), 11-25.	OQ
1979 - 1987	British Geological Survey particle size analysis (PSA) data (dates refer to data collection period for the entire dataset)	OSSG