

**Scottish MPA Project
Data confidence assessment**

SOUTHERN TRENCH MPA PROPOSAL

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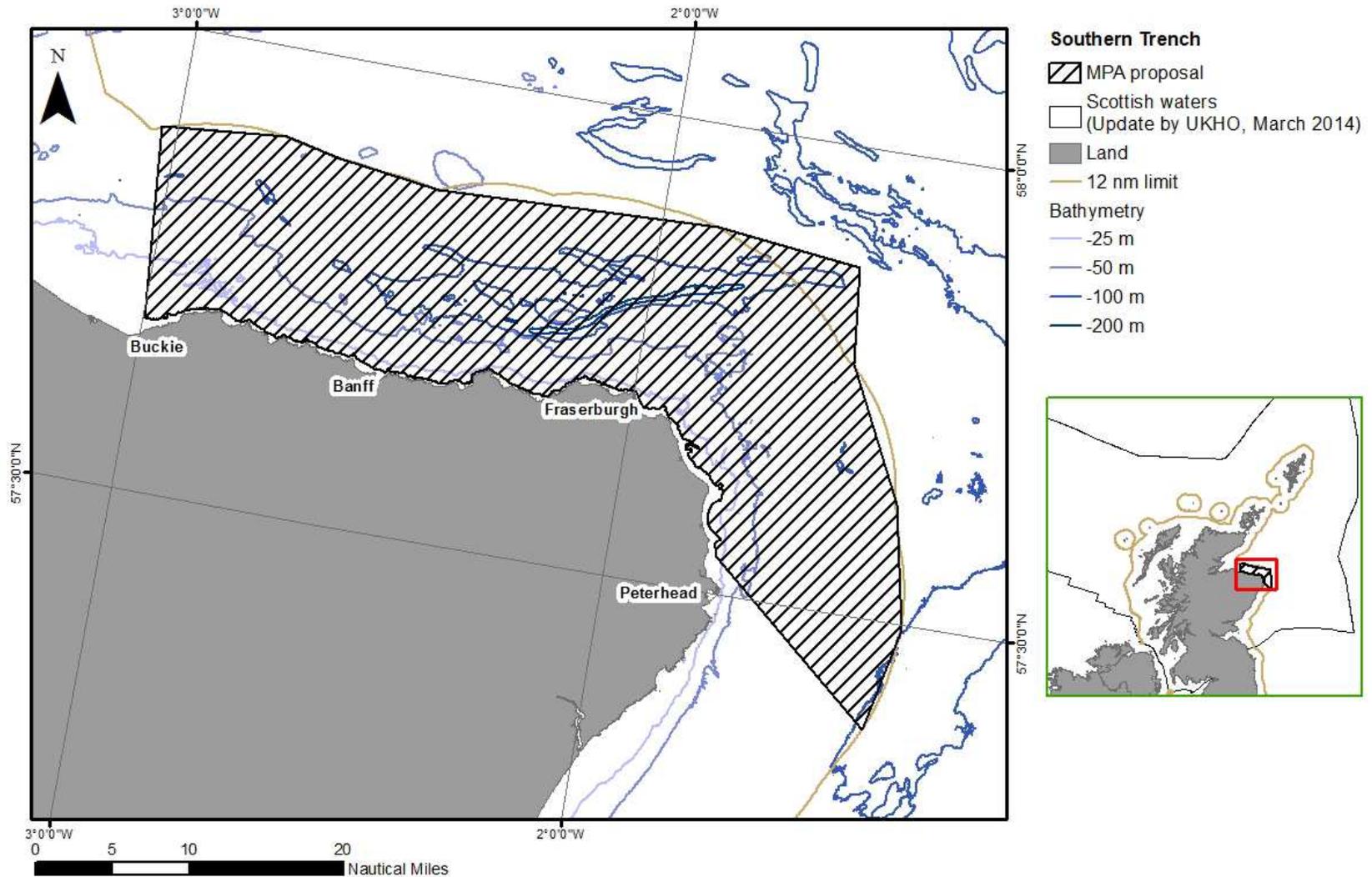
Version	Date	Author	Reason / Comments
Version 1	29/01/2014	Laura Clark	Revised MPA proposal format, updating MPA search location version (ver. 10 - 20/12/2012).
Version 2	17/02/2014	Morven Carruthers	Revised text and mapping.
Version 3	23/04/2014	Morven Carruthers and Katie Gillham	Edits to address comments from SAC.
Version 4	17/07/2014	Morven Carruthers	Minor updates and mapping.
Version 5	21/07/2014	John Baxter	QA review and sign-off.
Version 6	24/07/2014	Katie Gillham	Edits to address QA comments.

Distribution list			
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Format	Version	Issue date	Issued to
Electronic	SL10	20/12/2012	SNH web publication [B1149456 / 25(#44)].
Electronic	2	17/02/2014	SNH SAC MPA Sub-group.
Electronic	5	23/07/2014	Marine Scotland officials.
Electronic	5	24/07/2014	SNH web publication [A1122998 / 16(#24)].

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Figure 1 The Southern Trench MPA proposal



Map projected in Europe Albers Equal Area Conic (Modified Standard Parallels - Standard Parallel 1 = 50.2; Standard Parallel 2 = 58.5). 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 2013. All rights reserved. Scotland (Adjacent waters) Updated by the Law of the Sea Division, United Kingdom Hydrographic Office October 2005. Bathymetry © Crown Copyright 2014. All rights reserved. License No. EK001-201310001. Not to be used for navigation. MPA proposals ©SNH 2014.

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Name of MPA proposal	Southern Trench	Assessor(s)	BJ; LC; SM; LK; KG; MC
<p>The Southern Trench MPA proposal is shown on Figure 1. It is shaped around the Southern Trench, a large undersea valley consisting of an area of deep water (~200 m) extending along the south of the outer Moray Firth, approximately 10 km from the coast between Banff and Fraserburgh. The Southern Trench is an exceptional example of an enclosed (glacial) seabed basin and is regarded as scientifically important in helping to understand ice sheet drainage patterns in this region. Detailed morphological analysis suggests it was formed from at least two erosion events operating in different directions (Brooks <i>et al.</i>, 2013). Shelf deeps in the MPA proposal are enclosed topographic depressions on the sea bed which, in most cases, are created by glacial erosion during periods of low sea level. The resulting deeps have remained open and are significantly deeper than surrounding sea bed. Large numbers of juvenile fish have been recorded within the shelf deep (Hirst <i>et al.</i>, 2012) perhaps indicating the shelf deep represents an important nursery area for certain species. The waters off Fraserburgh produce frontal zones with strong horizontal gradients in surface and/or bottom temperatures. Fronts can concentrate nutrients and plankton and are often associated with pelagic biodiversity hotspots as they attract prey assemblages and higher trophic level foragers such as cetaceans. The boundary reflects the 12 nautical mile limit for cetaceans as MPA search features in Scottish territorial waters. The southern boundary of the MPA proposal has been shaped to incorporate the core part of the front off Fraserburgh. The geology and hydrography of the MPA proposal form a backdrop for a further two protected features: burrowed mud and minke whale. Minke whales are sighted particularly frequently in the outer Moray Firth (the northern section of the MPA proposal) during summer, while burrowed mud is contained within the Southern Trench deep. The MPA proposal also overlaps the marine part of the Troup, Pennan and Lion's Heads Special Protection Area (SPA).</p>			

Protected features			
Biodiversity	<i>Burrowed mud (BM)</i> <i>Fronts (FR)</i> <i>Minke whale (MW)</i> <i>Shelf deeps (SD)</i>	Geodiversity	<i>Quaternary of Scotland - sub-glacial tunnel valleys and moraines (GEO)</i> <i>Submarine Mass Movement - slide scars (GEO)</i>

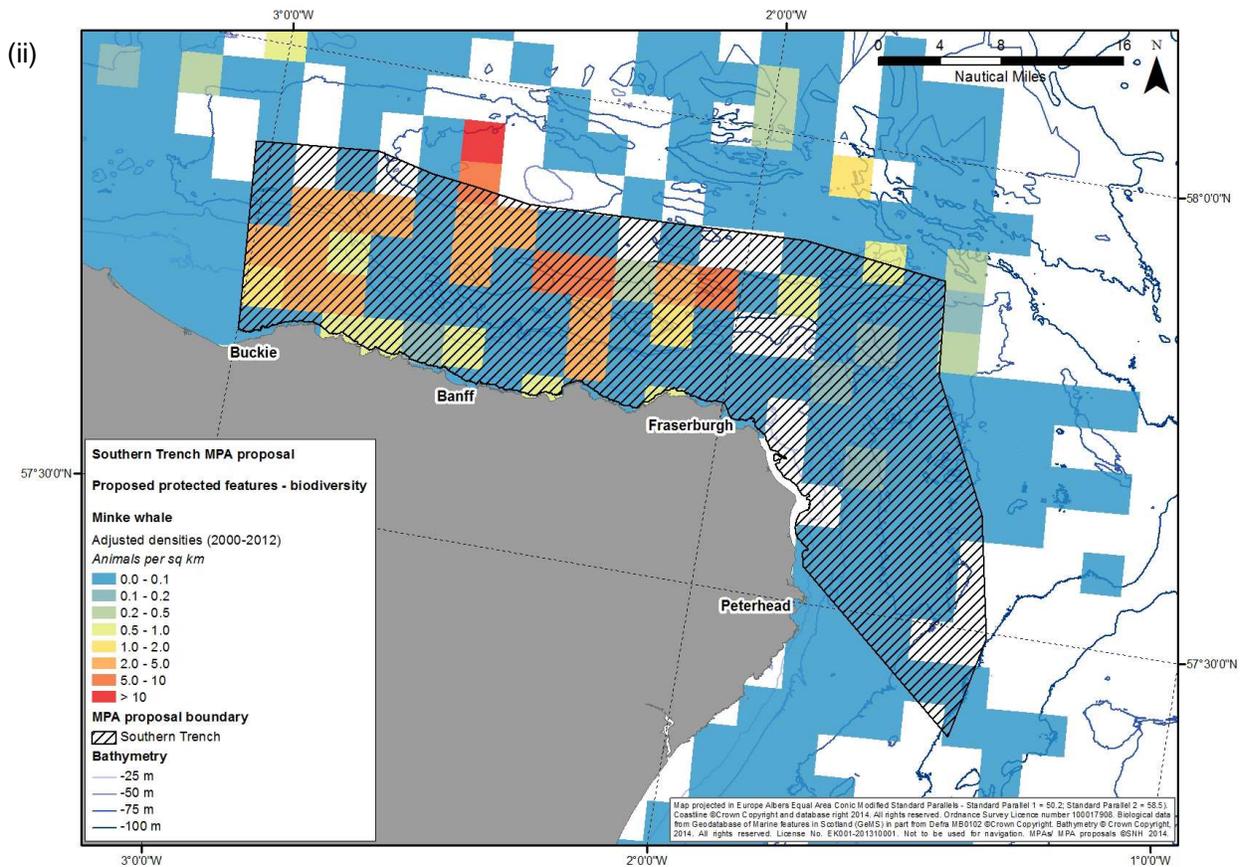
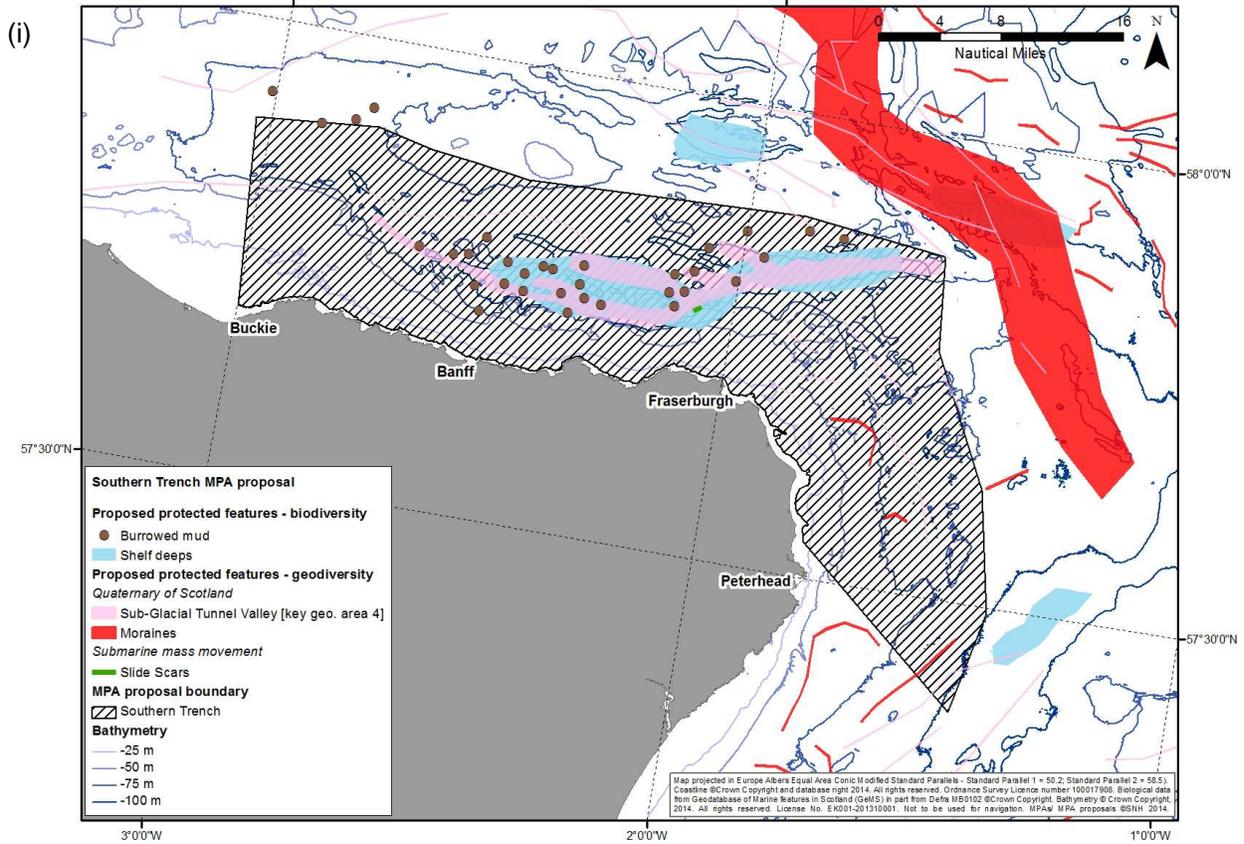
Data used in assessment			
Version of GeMS database	Ver.4	Other datasets used in feature map (specify) -	<p><i>Marine Scotland Science 2008 - 2010 Nephrops underwater TV survey database.</i></p> <p><i>Habitat modelling: Aggregated effort-corrected sightings data and modelled predicted densities and persistence of minke whale 2000 - 2012.</i></p> <p><i>Defra MB0102. Task 2F. Seasonal frequent fronts data layers at 1.2km resolution based on ocean thermal imagery (Dec 1998 - Nov 2008).</i></p> <p><i>Peter Miller. Seasonal frequent fronts datalayers at 300 m and 1 km resolution based on ocean colour imagery (2009 - 2011).</i></p> <p><i>SEA / Marine Scotland multibeam dataset (2010/11) with BGS / SNH interpretation.</i></p> <p><i>Marine Scotland East coast of Scotland PMF study 2011.</i></p>

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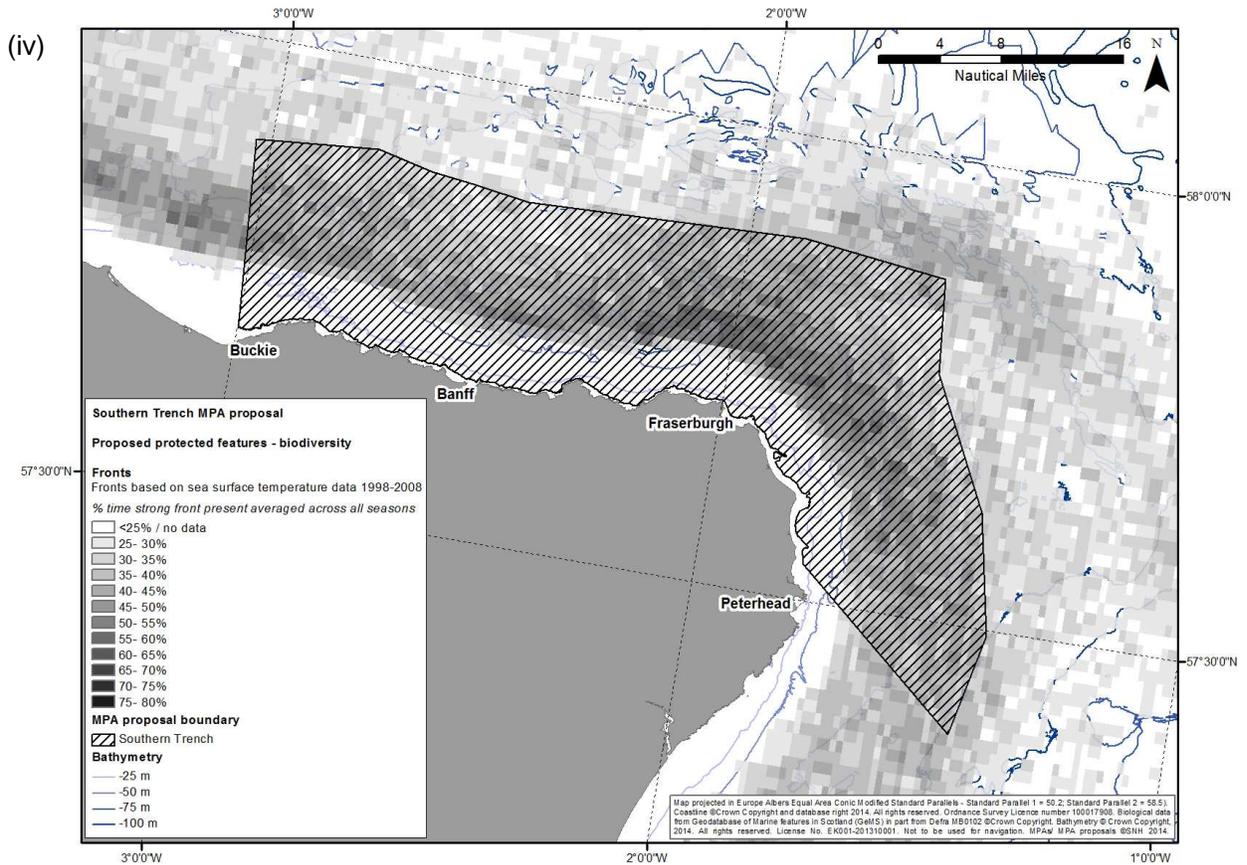
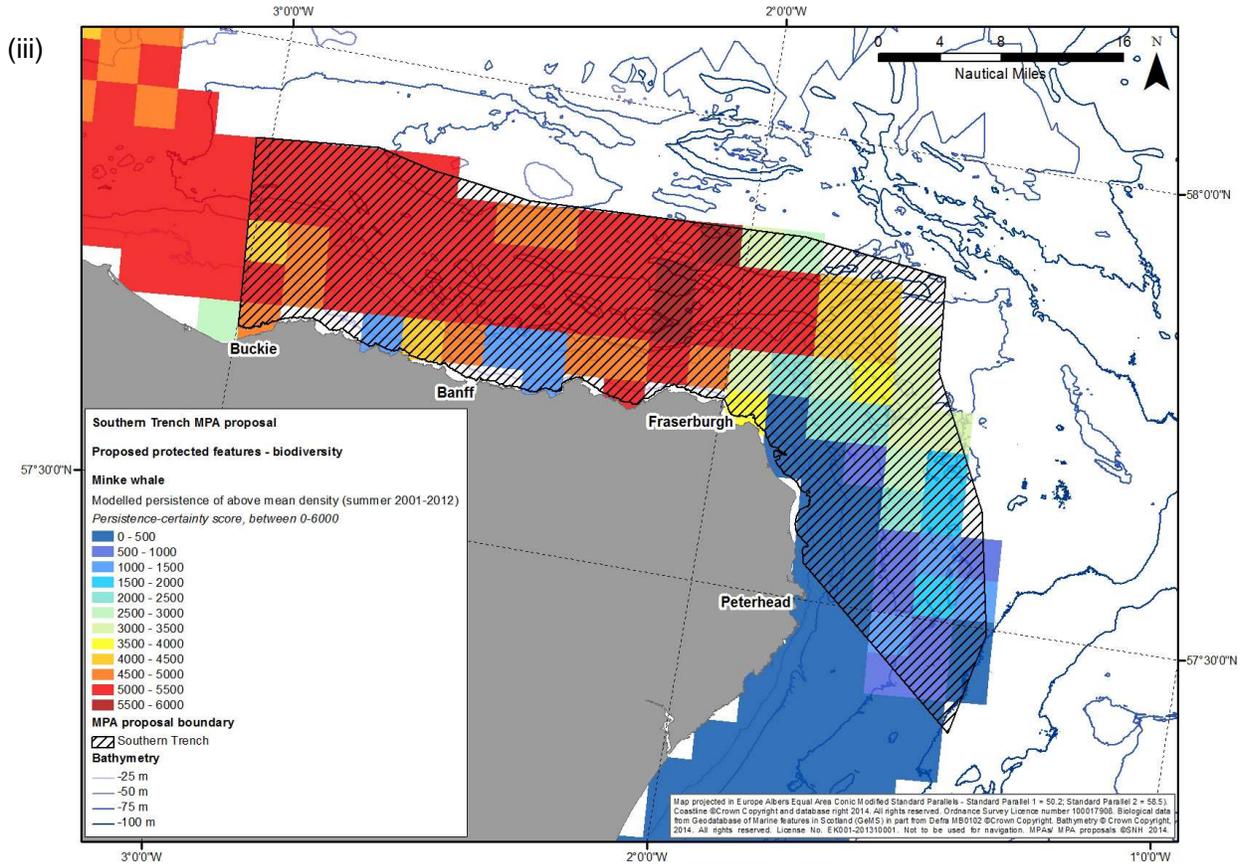
Summary of data confidence assessment (see detailed assessment on following pages)							
Confident in underpinning data		Yes	✓	Partial		No	
Confident in presence of identified features?	✓	Data suitable to define extent of individual protected features	✓		Partial		
			BM;FR;SD;GEO; MW				
Summary	<p><i>We are confident in the presence of the protected features within the MPA proposal and the underpinning data. The data on these features are shown in Figure 2i - iv overleaf.</i></p> <p><i>The shelf deeps of the Southern Trench have been mapped recently as part of a SEA/Marine Scotland multibeam survey in 2010/11 (unpublished). Burrowed mud has been recorded at a high resolution across and beyond the shelf sill by Marine Scotland Nephrops fisheries surveys in 2008 - 2010 and an MS East Coast PMF survey in 2011. The presence and distribution of seasonal frontal systems within the MPA proposal has been determined from ocean thermal imagery, and data on the geodiversity protected features stem from a number of sources (collated through Brooks et al., 2013).</i></p> <p><i>There is high confidence in the presence of minke whales, based on effort corrected sightings data collated for the Joint Cetacean Protocol (JCP) and additional datasets, as analysed by Paxton et al. (2014) to inform the MPA project. The analysis uses survey data (2000 - 2012) from 23 distinct datasets and includes the latest available data (2010 - 2012) from The Cetacean Research and Rescue Unit (CRRU) that runs a programme of surveys in a region of the outer Moray Firth overlapping the MPA proposal. Adjusted observed densities for minke whale, based on all the data available for spring, summer and autumn, suggest that the species is observed at high relative densities within the MPA proposal compared to wider Scottish territorial waters. When these data are modelled, an area of the outer Moray Firth overlapping the MPA proposal is persistently predicted to support above average densities of minke whale (at scale of Scottish territorial waters) over the period from 2000 to 2012 (Paxton et al., 2014).</i></p>						

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Figures 2i - iv The known distribution of proposed protected features within the Southern Trench MPA proposal



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Data confidence assessment	Our assessment of data confidence is based on consideration of the age and sources of the data, sampling methods used and overall coverage across the MPA proposal (see Figure 2 and Maps A - C).
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Age of proposed protected feature data				
Number of records collected within last 6 years	Many BM;FR;SD, MW	Number of records collected 6-12 years ago	Many FR;MW	Number of records >12 years old
Comments	<p>The shelf deeps of the Southern Trench have been mapped recently as part of SEA and Marine Scotland multibeam surveys of the area in 2010 and 2011. Records of burrowed mud across and beyond the shelf sill were made between 2008 and 2010 by Marine Scotland Nephrops fisheries surveys and in 2011 by the Marine Scotland East Coast PMF survey. Ocean thermal imagery has informed the presence and distribution of seasonal frontal systems in a study that used data from December 1998 - November 2008. Minke whale data comprise datasets collated for the Joint Cetacean Protocol (JCP) and additional datasets, as analysed by Paxton et al. (2014) as part of spatial modelling undertaken to inform the MPA project. Twenty-three separate datasets (with records from between 2000-2012) were used to inform the analysis, including the latest CRRU data (2010 - 2012) that were collected from within the MPA proposal.</p>			

Source of proposed protected feature data					
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) -	
Comments	<p>Burrowed mud has been recorded as a result of Nephrops fishery survey work undertaken by Marine Scotland. Targeted nature conservation orientated research surveys included the SEA/MS multibeam survey and ocean thermal imagery studies by Defra, which delivered data on shelf deeps, fronts, burrowed mud and geodiversity features. Further geodiversity features were derived from a data collation exercise undertaken as part of a Defra-led research project (Brooks et al., 2009) with the key geodiversity areas subsequently identified through an SNH and JNCC commissioned desk-based review (Brooks et al., 2013).</p> <p>Minke whale data comprise datasets collated for the Joint Cetacean Protocol (JCP) and additional datasets, as analysed by Paxton et al. (2014) to inform the MPA project. The analysis uses 23 different datasets including: the SCANS & SCANSII projects coordinated by the Sea Mammal Research Unit; the European Seabirds at Sea studies coordinated by the Joint Nature Conservation Committee; data from the Sea Watch Foundation that come from a range of different projects and surveys, including data collected by volunteers; Hebridean Whale and Dolphin Trust data; University of Aberdeen data from the Moray Firth and from ferry route surveys on the west coast, and data from the Cetacean Research and Rescue Unit, that run a programme of surveys in the outer Moray Firth overlapping the MPA proposal. The full list of datasets used in the analysis is described in Paxton et al. (2014).</p>				

Sampling methods / resolution							
Feature	Modelled	Acoustic / remote sensing	Remote video / camera	Infaunal - grab / core	Sediment	Diving	Visual census
BM		✓	✓	✓	✓		

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Sampling methods / resolution							
Feature	Modelled	Acoustic / remote sensing	Remote video / camera	Infaunal - grab / core	Sediment	Diving	Visual census
FR	✓						
MW	✓						✓
SD	✓	✓	✓				
Comments	<p>The MS Nephrops survey sampled burrowed mud using grab, remote video and acoustic multibeam methods. The shapes of the shelf deeps have been modelled from these data and the SEA / Marine Scotland multibeam dataset (2010/11). The distribution of fronts is derived from ocean thermal imagery data at 1 - 4 km resolution, collected between December 1998 and November 2008. The resulting frequent thermal front layers are mapped to a resolution of 1.2 km. All minke whale data were sampled by visual census and only effort-corrected boat and aircraft-based sightings data were used. Twenty-three distinct datasets were aggregated as part of the analysis. All data were collected by observers who had observation as their primary task while on effort. The data were used to create estimated densities (corrected for availability and detectability) of minke whale per square km. These are mapped at a resolution of 5 km x 5 km. Generalised Estimating Equation (GEE) models were then used to predict relative densities of minke whale for all of Scottish territorial waters on a 5 km x 5 km resolution grid. The highest survey effort for minke whale across Scottish waters is during summer, which reflects both the seasonal occurrence of the species and the fact that cetacean surveys are highly dependent on weather and sea-state.</p>						

Proposed protected feature data coverage							
Across the MPA proposal							
Large numbers of proposed protected feature records distributed across the MPA proposal		Numerous proposed protected feature records scattered across the MPA proposal with some clumping	✓	Numerous proposed protected feature records possibly with some clumping. Boundary not defined solely by recorded feature distribution		Few or isolated proposed protected feature records - possibly clumped	
For individual features							
Multiple records of individual proposed protected features providing an indication of extent and distribution throughout the MPA proposal	✓	Few or scattered records of specific proposed protected features making extent and broad distribution assessment difficult		Few or isolated records of specific proposed protected features			
Are acoustic remote sensing data available to facilitate the development of a full coverage predictive seabed habitat map?	Yes. Acoustic multibeam data are available for the full extent of the shelf deeps area						

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Proposed protected feature data coverage	
Comments	<p>There is high confidence in the presence of all protected features in this MPA proposal. The data suitably define the extent of fronts, shelf deeps and geodiversity features. The extent of burrowed mud is well defined in the northern part of the search location, but data are lacking to define its distribution in the southern part.</p> <p>There is high confidence in the seasonal presence of high relative densities of minke whale within the MPA proposal (relative to wider Scottish waters) based on effort corrected sightings of minke whale, and also from modelling which predicts that the Moray Firth persistently supports above average densities of the species during summer. Areas to the west of the MPA proposal which are predicted to persistently support above average densities of minke whale have not been included in the boundary because of a lack of effort corrected sightings data. Minke whales are thought to move into the area for feeding during the summer months.</p>

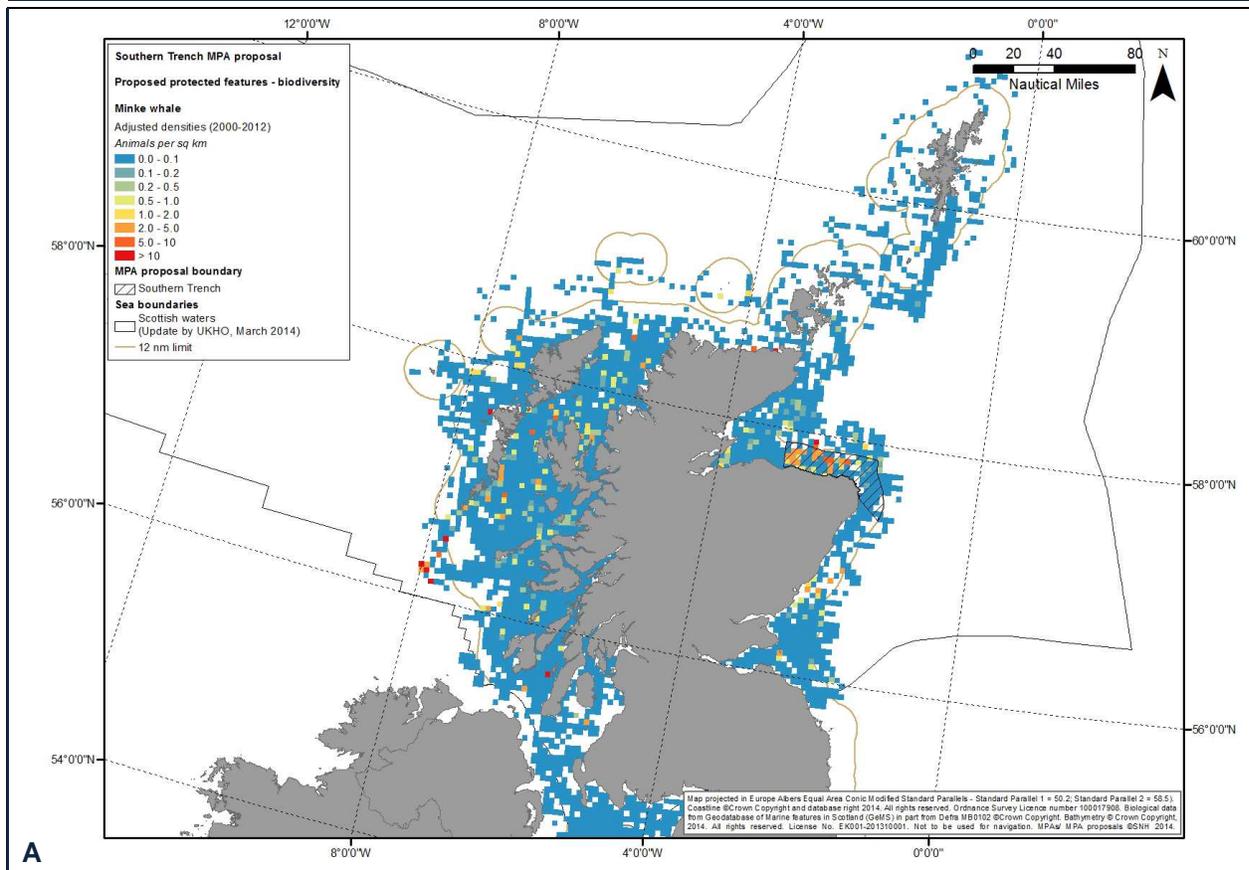
Data sources and bibliography		
Year	Title	Features covered
2014	Paxton, C.G.M., Scott-Hayward, L.A.S. and Røxstad, E. (2014). Statistical approaches to aid the identification of Marine Protected Areas for minke whale, Risso's dolphin, white-beaked dolphin and basking shark. <i>Scottish Natural Heritage Commissioned Report No. 594</i> . Available from < http://www.snh.org.uk/pdfs/publications/commissioned_reports/594.pdf >	MW
2014	Miller, P.I., Xu, W. and Lonsdale, P. (2014). Seasonal shelf-sea front mapping using satellite ocean colour to support development of the Scottish MPA network. <i>Scottish Natural Heritage Commissioned Report No. 538</i> . Available from < http://www.snh.org.uk/pdfs/publications/commissioned_reports/538.pdf >	FR
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 (final report). <i>Scottish Natural Heritage Commissioned Report No. 432</i> . Available from < http://www.snh.org.uk/pdfs/publications/commissioned_reports/432.pdf >	GEO
2012	Hirst, N.E., Clark, L. and Sanderson, W.G. (2012). The distribution of selected MPA search features and Priority Marine Features off the NE coast of Scotland. <i>Scottish Natural Heritage Commissioned Report No.500</i> . Available from < http://www.snh.org.uk/pdfs/publications/commissioned_reports/500.pdf >	BM
2012	Marine Scotland Science. (2012). <i>Marine Protected Areas and cetaceans. Position paper for the 4th MPA Workshop, Heriot-Watt University, 14-15 March 2012</i> . Available from < http://www.scotland.gov.uk/Resource/0038/00389523.doc >	MW
2012	Marine Scotland Science (2012). <i>Marine Protected Areas and large scale features. Position paper for the 4th MPA Workshop, Heriot-Watt University, 14-15 March 2012</i> . Available from < http://www.scotland.gov.uk/Resource/0038/00389524.doc >	SD
2010	Miller, P.I., Christodoulou, S. and Saux-Picart, S. (2010). <i>Oceanic thermal fronts from Earth observation data - a potential surrogate for pelagic diversity</i> . Report to the Department of Environment, Food and Rural Affairs. Defra Contract No. MB102. Plymouth Marine Laboratory, subcontracted by ABPmer, Task 2F, pp. 24. Available from < http://randd.defra.gov.uk/Document.aspx?Document=MB0102_9104_TRP.pdf >	FR
2009	Brooks, A.J., Roberts, H., Kenyon, N.H. and Houghton, A.J. (2009). <i>Accessing and developing the required biophysical datasets and datalayers for Marine Protected Areas network planning and wider marine spatial planning purposes. Report No 8: Task 2A. Mapping of Geological and Geomorphological Features</i> . ABP Marine Environmental Research Ltd. Available from < http://randd.defra.gov.uk/Document.aspx?Document=mb0102_8589_TRP.pdf >	GEO

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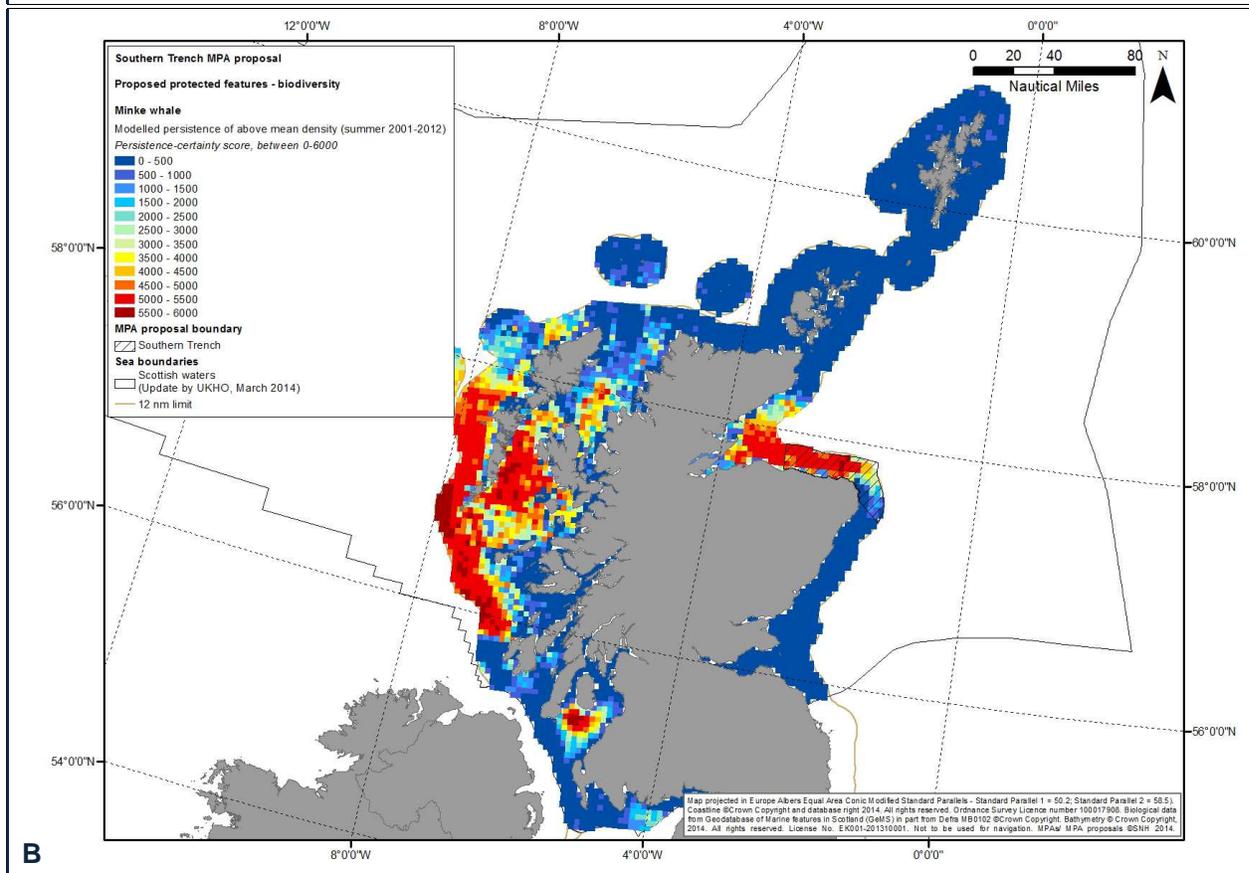
Data sources and bibliography		
Year	Title	Features covered
2008	Bradwell, T., Stoker, M.S., Golledge, N.R., Wilson, C.K., Merritt, J.W., Long, D., Everest, J.D., Hestvik, O.B., Stevenson, A.G., Hubbard, A.L., Finlayson, A.G. and Mathers, H.E. (2008). The northern sector of the last British Ice Sheet: Maximum extent and demise. <i>Earth-Science Reviews</i> 88 : 207-226.	GEO
2007	Robinson, K.P., Baumgartner, N., Eisfeld, S.J., Clark, N.M., Culloch, R.M., Haskins, G.M., Zapponi, L., Whaley, A.R., Weare, J.S. and Tetley, M.J. (2007). The summer distribution and occurrence of cetaceans in coastal waters in the outer southern Moray Firth in northeast Scotland (UK). <i>Lutra</i> 50 : 19-30.	MW
-	BGS unpublished data	GEO
-	UKHO Admiralty Chart	GEO

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THE EVIDENCE-BASE

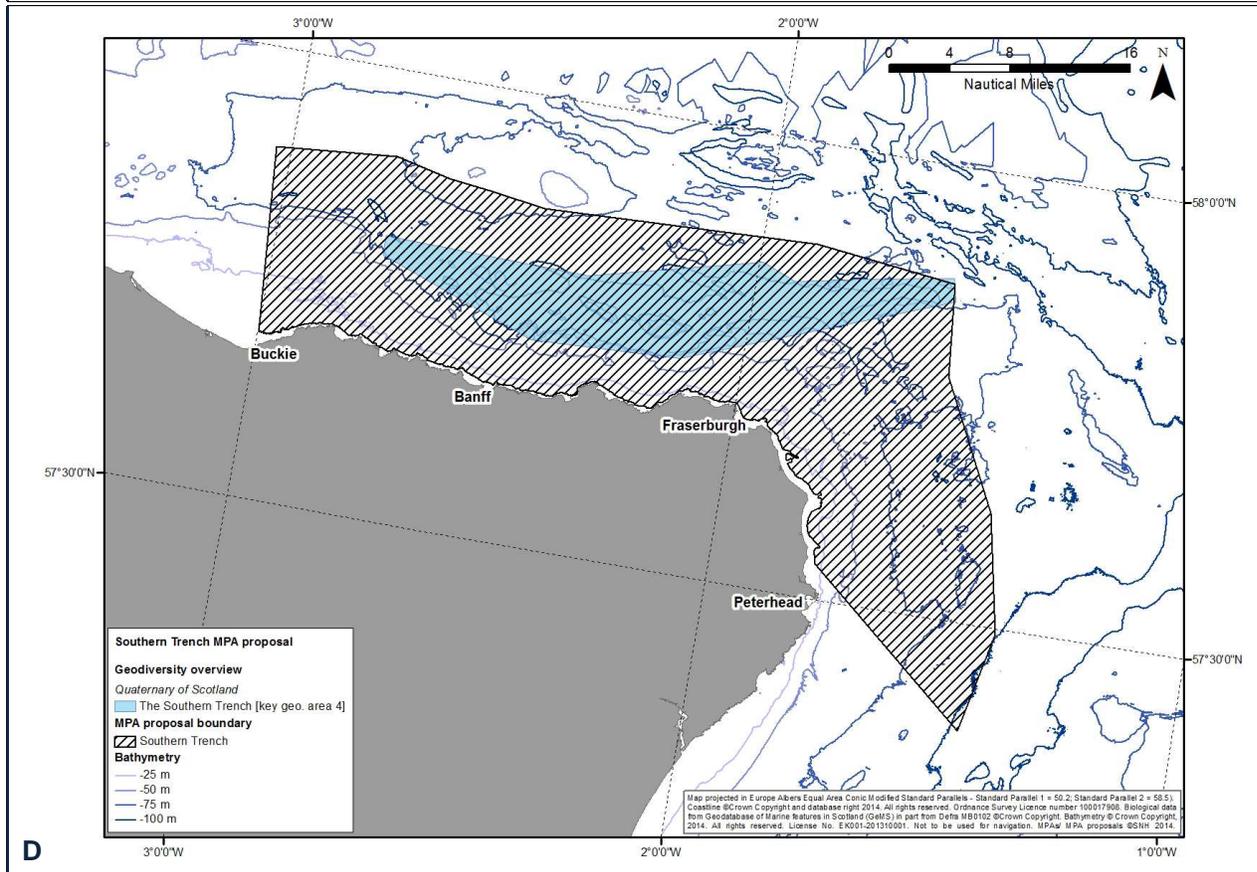
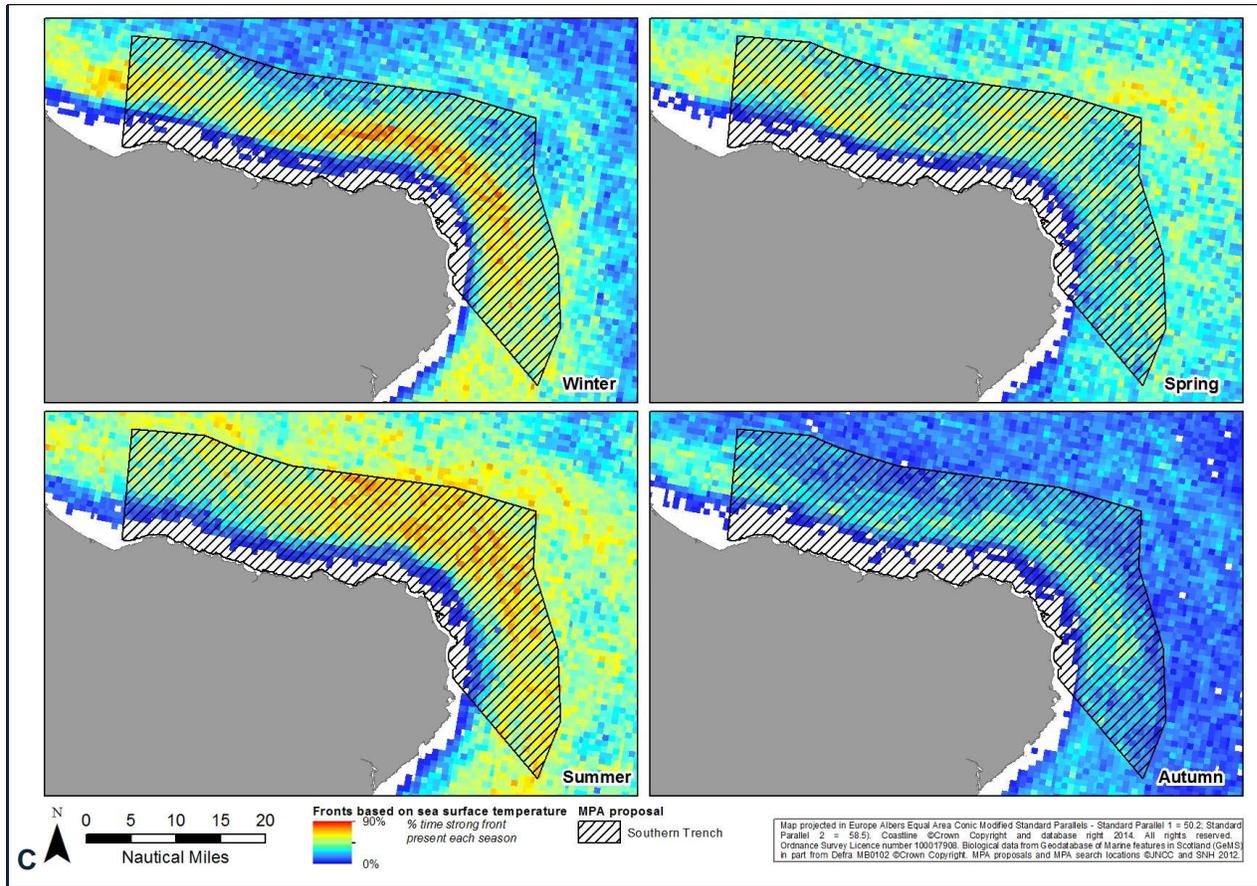


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B

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