European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC)

Fourth Report by the United Kingdom under Article 17

on the implementation of the Directive
from January 2013 to December 2018

Supporting documentation for the
conservation status assessment for the habitat:

H1140 - Mudflats and sandflats not covered by seawater at low tide

SCOTLAND

IMPORTANT NOTE - PLEASE READ

- The information in this document is a country-level contribution to the UK Report on the conservation status of this habitat, submitted to the European Commission as part of the 2019 UK Reporting under Article 17 of the EU Habitats Directive.
- The 2019 Article 17 UK Approach document provides details on how this supporting information was used to produce the UK Report.
- The UK Report on the conservation status of this habitat is provided in a separate document.
- The reporting fields and options used are aligned to those set out in the European Commission guidance.
- Explanatory notes (where provided) by the country are included at the end. These provide an audit trail of relevant supporting information.
- Some of the reporting fields have been left blank because either: (i) there was insufficient information to complete the field; (ii) completion of the field was not obligatory; and/or (iii) the field was only relevant at UK-level (sections 10 Future prospects and 11 Conclusions).
- For technical reasons, the country-level future trends for Range, Area covered by habitat and Structure and functions are only available in a separate spreadsheet that contains all the country-level supporting information.
- The country-level reporting information for all habitats and species is also available in spreadsheet format.

Visit the JNCC website, https://jncc.gov.uk/article17, for further information on UK Article 17 reporting.

Report on the main results of the surveillance under Article 17 for Annex I habitat types (Annex D)

NATIONAL LEVEL

1. General information

1.1 Member State	**UK (Scotland information only)**
1.2 Habitat code	**1140 - Mudflats and sandflats not covered by seawater at low tide**

2. Maps

2.1 Year or period	
2.3 Distribution map	Yes
2.3 Distribution map Method used	
2.4 Additional maps	No

BIOGEOGRAPHICAL LEVEL

3. Biogeographical and marine regions

3.1 Biogeographical or marine region where the habitat occurs	**Marine Atlantic (MATL)**
3.2 Sources of information	Harries, D.B., Moore, C.G., Cook, R.L. & Brash, J. 2015. 2014 site check survey and biotope mapping of the intertidal sediment flats of the Loch Moidart and Shiel Woods SAC. Scottish Natural Heritage Commissioned Report No. 809. Moore, C.G., Harries, D.B., Brash, J. & Tulbure, K.W. 2016. 2015 site condition monitoring survey and biotope mapping of the intertidal sediment flats of Loch Paible, North Uist (Balranald Bog and Loch nam Feithean SSSI). Scottish Natural Heritage Commissioned Report No. 922. Moore, C.G., Harries, D.B., Lyndon, A.R., Mair, J.M., Tulbure, K.W., Saunders, G.R, Grieve, R. & Brash, J. 2016. 2015 site condition monitoring and site check surveys of marine sedimentary and reef habitats in the Loch nam Madadh SAC, Loch nam Madadh SSSI and Loch an Duin SSSI. Scottish Natural Heritage Commissioned Report No. 923. Allen, J.H. 2018. Infaunal and PSA analyses of benthic samples collected from the South of Skye, Southannan Sands SSSI and Mousa SAC / MPA in 2016. Scottish Natural Heritage Commissioned Report No. 1037. Schumacher, J., Dolch, T., & Reise, K. (2014). Transitions in sandflat biota since the 1930s: effects of sea-level rise, eutrophication and biological globalization in the tidal bay Konigshafen, northern Wadden Sea. Helgoland marine research, 68(2), 289. Frid, C. L. J., Chandrasekara, W. U., & Davey, P. (1999). The restoration of mud flats invaded by common cord-grass (Spartina anglica, CE Hubbard) using mechanical disturbance and its effects on the macrobenthic fauna. Aquatic Conservation: Marine and Freshwater Ecosystems, 9(1), 47-61. Gill, (2012) Processes influencing bird use of estuarine mudflats and saltmarshes in western Europe in: J. A. Fuller, R. J. (Ed.). (2012). Birds and habitat: relationships in changing landscapes. Cambridge University Press. Tyler-Walters, H., & Arnold, C. (2008). Sensitivity of Intertidal Benthic Habitats to Impacts Caused by Access to Fishing Grounds. Mossman, H., Grant, A., & Davy, A. J. (2013). Implications of climate change for coastal and inter-tidal habitats in the UK. University of East Anglia. Biodiversity Report Card paper 10. Guy-Haim, T., Lyons, D. A., Kotta, J., Ojaveer, H., Queiros, A. M., Chatzinikolaou, E., & Orav-Kotta, H. (2018). Diverse effects of invasive ecosystem engineers on marine biodiversity and ecosystem functions: A global review and meta-analysis.

Report on the main results of the surveillance under Article 17 for Annex I habitat types (Annex D)

Global change biology.
Blaber, S. J., Cyrus, D. P., Albaret, J. J., Ching, C. V., Day, J. W., Elliott, M., ... & Silvert, W. (2000). Effects of fishing on the structure and functioning of estuarine and nearshore ecosystems. ICES Journal of Marine Science, 57(3), 590-602.
Ferns, P. N., Rostron, D. M., & Siman, H. Y. (2000). Effects of mechanical cockle harvesting on intertidal communities. Journal of Applied Ecology, 37(3), 464-474.
Piersma, T., Koolhaas, A., Dekinga, A., Beukema, J. J., Dekker, R., & Essink, K. (2001). Long-term indirect effects of mechanical cockle-dredging on intertidal bivalve stocks in the Wadden Sea. Journal of Applied Ecology, 38(5), 976-990.
Woolmer, Andrew. Appropriate assessment and shellfisheries: adaptive management protocol. Report to shellfish industry development strategy. Salacia-Marine Ltd (2009).
Shepherd, P. C., & Boates, J. S. (1999). Effects of a commercial baitworm harvest on semipalmated sandpipers and their prey in the Bay of Fundy hemispheric shorebird reserve. Conservation Biology, 13(2), 347-356.
Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F., Editors. (2011).Scotland's Marine Atlas: information for the national marine plan. Marine Scotland, Edinburgh. Available from: http://www.gov.scot/Topics/marine/science/atlas
Scotland's Dynamic Coast - National Coastal Change Assessment. http://www.dynamiccoast.com/
Scottish Climate Change Adaptation Programme. http://www.gov.scot/Resource/0045/00451392.pdf

4. Range

4.1 Surface area (in km²)	772.34	
4.2 Short-term trend Period		
4.3 Short-term trend Direction		
4.4 Short-term trend Magnitude	a) Minimum	b) Maximum
4.5 Short-term trend Method used		
4.6 Long-term trend Period		
4.7 Long-term trend Direction		
4.8 Long-term trend Magnitude	a) Minimum	b) Maximum
4.9 Long-term trend Method used		
4.10 Favourable reference range	a) Area (km²)	
	b) Operator	
	c) Unknown	No
	d) Method	
4.11 Change and reason for change in surface area of range	No change	
	The change is mainly due to:	
4.12 Additional information		

5. Area covered by habitat

5.1 Year or period			
5.2 Surface area (in km²)	a) Minimum 772.34	b) Maximum 772.34	c) Best single value 772.34
5.3 Type of estimate			
5.4 Surface area Method used			
5.5 Short-term trend Period			

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5.6 Short-term trend Direction			
5.7 Short-term trend Magnitude	a) Minimum	b) Maximum	c) Confidence interval
5.8 Short-term trend Method used			
5.9 Long-term trend Period			
5.10 Long-term trend Direction			
5.11 Long-term trend Magnitude	a) Minimum	b) Maximum	c) Confidence interval
5.12 Long-term trend Method used			
5.13 Favourable reference area	a) Area (km²) b) Operator c) Unknown No d) Method		
5.14 Change and reason for change in surface area of range	No change The change is mainly due to:		
5.15 Additional information			

6. Structure and functions

6.1 Condition of habitat	a) Area in good condition (km²)	Minimum	398.0794	Maximum	398.0794
	b) Area in not-good condition (km²)	Minimum	374.26098	Maximum	374.26098
	c) Area where condition is not known (km²)	Minimum	0	Maximum	0
6.2 Condition of habitat Method used	Based mainly on extrapolation from a limited amount of data				
6.3 Short-term trend of habitat area in good condition Period	2007-2018				
6.4 Short-term trend of habitat area in good condition Direction	Stable (0)				
6.5 Short-term trend of habitat area in good condition Method used	Based mainly on extrapolation from a limited amount of data				
6.6 Typical species	Has the list of typical species changed in comparison to the previous reporting period?	No			
6.7 Typical species Method used					
6.8 Additional information					

7. Main pressures and threats

7.1 Characterisation of pressures/threats

Pressure	Ranking
Modification of coastline, estuary and coastal conditions for development, use and protection of residential, commercial, industrial and recreational infrastructure and areas (including sea defences or coastal protection works and infrastructures) (F08)	M
Marine fish and shellfish harvesting (professional, recreational) causing reduction of species/prey populations and disturbance of species (G01)	M

Other invasive alien species (other then species of Union concern) (I02)	M
Marine fish and shellfish harvesting (professional, recreational) activities causing physical loss and disturbance of seafloor habitats (G03)	H
Transmission of electricity and communications (cables) (D06)	M
Industrial or commercial activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam) (F23)	M
Modification of flooding regimes, flood protection for residential or recreational development (F28)	M

Threat	Ranking
Modification of coastline, estuary and coastal conditions for development, use and protection of residential, commercial, industrial and recreational infrastructure and areas (including sea defences or coastal protection works and infrastructures) (F08)	M
Marine fish and shellfish harvesting (professional, recreational) causing reduction of species/prey populations and disturbance of species (G01)	M
Other invasive alien species (other then species of Union concern) (I02)	M
Sea-level and wave exposure changes due to climate change (N04)	M
Change of species distribution (natural newcomers) due to climate change (N08)	M
Marine fish and shellfish harvesting (professional, recreational) activities causing physical loss and disturbance of seafloor habitats (G03)	M
Transmission of electricity and communications (cables) (D06)	M
Industrial or commercial activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam) (F23)	M
Modification of flooding regimes, flood protection for residential or recreational development (F28)	M
Temperature changes (e.g. rise of temperature & extremes) due to climate change (N01)	M
Change of habitat location, size, and / or quality due to climate change (N05)	M

7.2 Sources of information

Schumacher, J., Dolch, T., & Reise, K. (2014). Transitions in sandflat biota since the 1930s: effects of sea-level rise, eutrophication and biological globalization in the tidal bay Konigshafen, northern Wadden Sea. Helgoland marine research, 68(2), 289.
Tyler-Walters, H., & Arnold, C. (2008). Sensitivity of Intertidal Benthic Habitats to Impacts Caused by Access to Fishing Grounds.

7.3 Additional information

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8. Conservation measures

8.1 Status of measures	a) Are measures needed?	Yes
	b) Indicate the status of measures	Measures identified and taken
8.2 Main purpose of the measures taken		Maintain the current range, population and/or habitat for the species
8.3 Location of the measures taken		Both inside and outside Natura 2000
8.4 Response to the measures		Short-term results (within the current reporting period, 2013-2018)
8.5 List of main conservation measures		

Management of professional/commercial fishing (including shellfish and seaweed harvesting) (CG01)

Implement climate change adaptation measures (CN02)

Reduce impact of outdoor sports, leisure and recreational activities (CF03)

Reduce impact of transport operation and infrastructure (CE01)

Manage conversion of land for construction and development of infrastructure (CF01)

Reduce/eliminate marine pollution from industrial, commercial, residential and recreational areas and activities (CF07)

Reduce/eliminate marine contamination with litter (CF08)

Manage changes in hydrological and coastal systems and regimes for construction and development (CF10)

Reduce/eliminate marine pollution from marine aquaculture (CG08)

Other measures to reduce impacts from marine aquaculture infrastructures and operation (CG09)

Management, control or eradication of other invasive alien species (CI03)

8.6 Additional information	For SACs conservation objectives, information on pressures and threats, and details of the habitats and species are contained within the Regulation 33 packages. Conservation measures for mudflats and sandflats include Nature Conservation Orders, Inshore Fishing Orders ad Nature Reserve aggreements. A Nature Conservation Order is in place to prevent the extraction of shellfish (except mussels) by mechanical means in the Dornoch Firth and Morrich More SAC . An Inshore Fishing Order (2015) prohibits the use of dredge, beam trawl, demersal seine net or demersal trawl throughout the Luce Bay and Sands SAC (up to MHWS). Mudflats and sandflats are protected in the Firth of Forth SSSI and the Cromarty Firth SSSI respectively and managed under a Nature Conservation Order. For SACs, licensable activities (e.g. aquaculture, renewable developments, coastal developments, activitie associated with shipping/vessels e.g. dredging, anchorage, moorings military activities) are subject to Habitiats Regulations Appraisal in Scotland which considers whether a particular plan or project (activities) will cause a likely significant effect on the habitat and result in an adverse effect on site integrity. If the tests of the HRA are not met then the development normally will not be allowed to continue unless suitable mitigation can be undertaken. For SSSIs, It is an offence for anyone to intentionally or recklessly damage the protected natural features of an SSSI. Those wishing to carry out certain activities within an SSSI must apply to SNH for consent. They are also considered for developments within the Environmental Impact Assessment process. Outside of protected areas, impacts are considered on Priority Marine Features (PMFs) (https://www.snh.scot/professional-advice/safeguarding-protected-areas-and-species/priority-marine-features-scotlands-seas). Mudflats are a PMF

and would therefore be considered under Scotland's National Marine Plan GEN Policy 9 (Marine Scotland 2015), which requires that development and use of the marine environment must not result in a significant impact on the national status of PMFs. Regional Marine Management Plans for some regions (Shetland, Clyde) have been developed which seek to identify the location of sensitive PMFs including some associated with subtidal sandbanks and propose regional marine management policies to limit impacts of activities on these features and site development in more appropriate places.
Conservation measures which will start to operate during the next reporting period:
Fisheries management measures for the Dornoch Firth and Morrich More, Solway Firth, Loch nam Madadh and the Firth of Tay and Eden Estuary will be consulted on in 2018 with an aim to implement these in 2019.

9. Future prospects

9.1 Future prospects of parameters	a) Range b) Area c) Structure and functions
9.2 Additional information	

10. Conclusions

10.1. Range	
10.2. Area	
10.3. Specific structure and functions (incl. typical species)	
10.4. Future prospects	
10.5 Overall assessment of Conservation Status	
10.6 Overall trend in Conservation Status	
10.7 Change and reasons for change in conservation status and conservation status trend	a) Overall assessment of conservation status No change The change is mainly due to: b) Overall trend in conservation status No change The change is mainly due to:
10.8 Additional information	

11. Natura 2000 (pSCIs, SCIs, SACs) coverage for Annex I habitat types

11.1 Surface area of the habitat type inside the pSCIs, SCIs and SACs network (in km² in biogeographical/ marine region)	a) Minimum	318.24459
	b) Maximum	318.24459
	c) Best single value	318.24459
11.2 Type of estimate	Best estimate	
11.3 Surface area of the habitat type inside the network Method used	Based mainly on extrapolation from a limited amount of data	

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11.4 Short-term trend of habitat area in good condition within the network Direction	Stable (0)
11.5 Short-term trend of habitat area in good condition within network Method used	Based mainly on extrapolation from a limited amount of data
11.6 Additional information	

12. Complementary information

12.1 Justification of % thresholds for trends	
12.2 Other relevant information	

Distribution Map

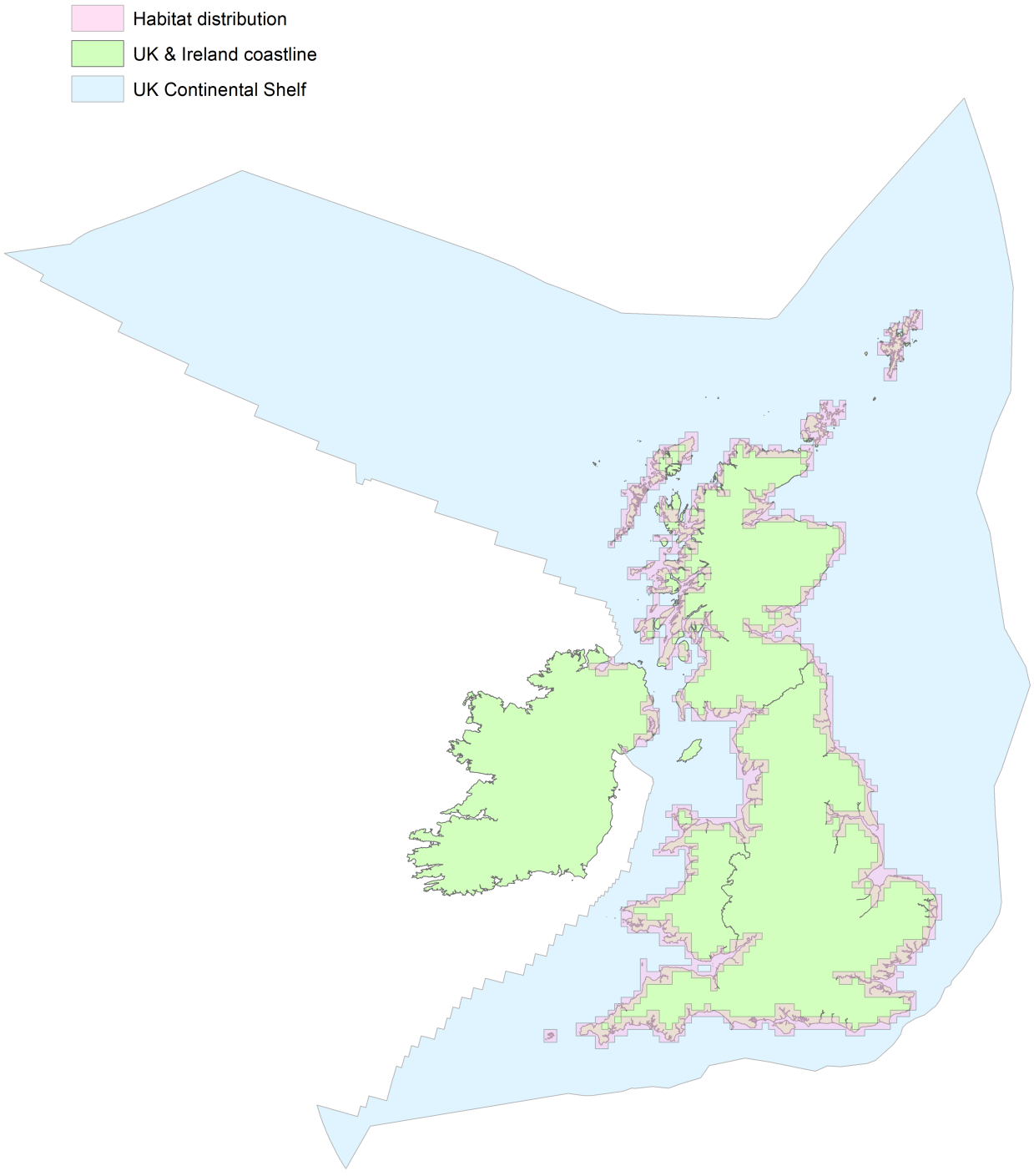

Figure 1: UK distribution map for H1140 - Mudflats and sandflats not covered by seawater at low tide.

The 10km grid square distribution map is based on available habitat records which are considered to be representative of the distribution within the current reporting period. For further details see the 2019 Article17 UK Approach document.

Range Map

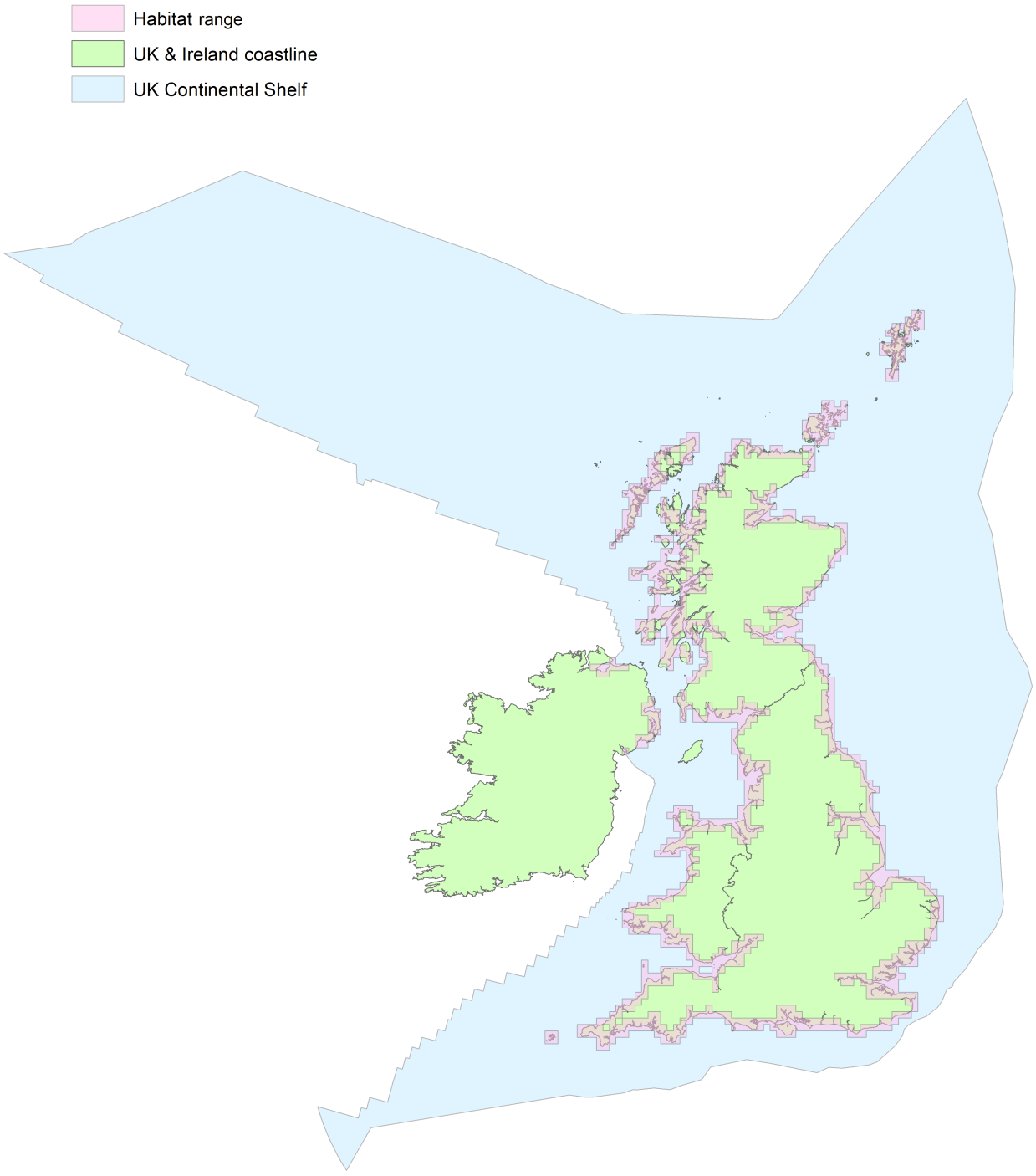

Figure 2: UK range map for H1140 - Mudflats and sandflats not covered by seawater at low tide.

The range of mudflats and sandflats is determined by physical and geological processes and was not related to the biological communities or processes supported by them. Therefore, the range was considered equivalent to the surface area of the habitat.

Explanatory Notes

Habitat code: 1140 Region code: MATL

Field label	Note
6.2 Condition of habitat; Method used	All SACs and SSSIs where mudflats and sandflats are protected as a feature have been assessed as being in favourable condition (see SNH doc A2664086) and therefore were classed as being in good condition and have been incorporated into the area in good condition (area in SACs = 318.244598km2, area in SSSIs = 79.8347643km2, total in good condition = 398.0794). In areas where the feature is protected in overlapping SACs and SSSIs, the area in the SAC was used. There was one area (Kettleloft Bay, Sanday which was in the East Sanday SSSI but not in Sanday SAC and this was included in the SSSI area calculation= 0.9455193km2). Outside of these protected sites, Scotland's Marine Atlas (Baxter et al., 2011) indicates that intertidal sediments have few/no concerns but are potentially deteriorating in the regions West Shetland, East Shetland, North Scotland Coast, Hebrides and Minches. In the other regions the atlas indicates that there are some concerns regarding this broad habitat type and that it is deteriorating. Therefore outside protected areas the areas associated with intertidal mudflats and sandflats have been assigned to not-good condition. SNH document A2631873 outlines the method used in more detail.
6.5 Short term trend of habitat area in good condition; Method used	There are limited studies where survey work has been carried out to assess the structure and function and change over time for mudflats and sandflats in SACs and SSSIs directly. However, 2003 baseline surveys in Loch Moidart and Shiel Woods SAC (Moore et al., 2004) were repeated in 2014 (Moore et al., 2014) and there was no evidence of temporal change in biotope composition. In addition, there has been no reduction in the extent of mudflat habitat along relocatable transects. A similar conclusion can be drawn from surveys of mudflats and sandflats in SSSIs (Moore et al., 2016a and 2016b; Allen, 2018) with no change in condition noted. The mudflats and sandflats within SSSIs assessed between 2007 - 2018 were all assessed as being in favourable condition (see SNH document A2664086 for details of these). In Baxter et al. (2011) they report that trend assessment for intertidal sediments across all regions of Scotland is 'deterioration'. The status assessment for intertidal sediments is that there are 'few/no concerns' in Shetland, North Scotland Coast, Minches and the Hebrides. However, we recognise that there may be potential deterioration outside of protected sites the other regions (Clyde, Solway, Forth, East Scotland, Moray Firth). In these areas outside of protected sites, the condition was assessed as being not-good.There is however, not enough evidence from these areas to amend our view of the short-term being stable, based on the monitoring data within protected areas. Note : The table showing the relationship between status assessment and trend assessment and good/not good condition for this Article 17 assessment is outlined in SNH's internal document reference A2631873.

9.1 Future prospects of parameters	We believe that the range of this habitat should remain stable in the future over the next 12 year period as we can not forsee circumstances where we would lose this habitat from the northern or southern extremes in Scotland that would alter its range. We have concluded that the area and structure and function is the future is unknown. This is because whilst there are fisheries measures currently in place or planned, both within MPAs and outside of protected areas, there is uncertainty about the dynamism of the coast and how this may change over the next 12 years. Intertidal sediments have and will continue to change over time. Loss of seagrass on intertidal sediments has been noted on the east coast. Under climate change pressures (outlined in summary in the Scottish Climate Change Adaptation Programme) it is unclear whether increases or decreases in these parameters will occur and what the overall affect on the feature in Scotland will be (see Scotland's Dynamic Coast - National Coastal Change Assessment). There are management measures in place and that are proposed again both inside and outside protected areas that should be of benefit to the structure and function of the habitat in the future.
11.5 Short term trend of habitat area in good condition within the network; Method used	There are limited studies where survey work has been carried out to assess the structure and function and change over time for mudflats and sandflats in SACs and SSSIs directly. However, 2003 baseline surveys in Loch Moidart and Shiel Woods SAC (Moore et al., 2004) were repeated in 2014 (Moore et al., 2014) and there was no evidence of temporal change in biotope composition. In addition, there has been no reduction in the extent of mudflat habitat along relocatable transects. A similar conclusion can be drawn from surveys of mudflats and sandflats in SSSIs (Moore et al., 2016a and 2016b; Allen, 2018) with no change in condition noted. The mudflats and sandflats within SSSIs assessed between 2007 - 2018 were all assessed as being in favourable condition (see SNH document A2664086 for details of these).