

**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:

**H1130 - Estuaries**

**WALES**

## **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 (Wales information only)
1.2 Habitat code	1130 - Estuaries

### 2. Maps

2.1 Year or period	2013-2018
2.3 Distribution map	Yes
2.3 Distribution map Method used	Based mainly on extrapolation from a limited amount of data
2.4 Additional maps	No

## BIOGEOGRAPHICAL LEVEL

### 3. Biogeographical and marine regions

3.1 Biogeographical or marine region where the habitat occurs	<b>Marine Atlantic (MATL)</b>
3.2 Sources of information	<p>Abu-Bakar A, Ahmadian R, Falconer RA. 2017. Modelling the transport and decay processes of microbial tracers in a macro-tidal estuary. <i>Water Research</i> 123: 802-824</p> <p>Ahmadian R, Abu-Bakar A, Falconer RA. 2016. Modelling Hydrodynamic Processes and Microbial Tracer Transport in the Loughor Estuary. Report for the Food Standards Agency. Cardiff University</p> <p>Bergmann M, Gutow L, Klages M. 2015. Marine Anthropogenic Litter. <a href="https://link.springer.com/content/pdf/10.1007%2F978-3-319-16510-3.pdf">https://link.springer.com/content/pdf/10.1007%2F978-3-319-16510-3.pdf</a></p> <p>Bohn K. 2014. The distribution and potential northwards spread of the invasive slipper limpet <i>Crepidula fornicata</i> in Wales, UK. NRW Evidence Report No: 40, 43pp, Natural Resources Wales, Bangor.</p> <p>Brazier DP. 2013. Evaluating intertidal <i>Zostera noltii</i> beds - field survey vs remote sensing. CCW Marine Monitoring Report No. 103. CCW, Bangor</p> <p>Brazier DP. in prep. Pembroke power Station - limpet size profiles. NRW data.</p> <p>Brazier DP, Robinson K. 2018. Article 17 GIS processing notes for Estuaries. Draft internal report, NRW.</p> <p>Bunker FStPD. 2015. Intertidal Monitoring of rocky reefs, Pembrokeshire Marine SAC. Population trends for selected species 2005 to 2014. NRW Evidence Report No: 59, 66pp, Natural Resources Wales, Bangor</p> <p>Bunker FStPD, Brazier DP. 2013. Monitoring of intertidal rocky reefs in Pembrokeshire Marine SAC, 2007 to 2010. CCW Marine Monitoring Report No: 101, 93pp + x, Countryside Council for Wales, Bangor.</p> <p>Bunker FStPD, Camplin MD. 2007. A study of the Milford Haven maerl bed in 2005 using drop down video and diving. A report to the Countryside Council for Wales by Marine Seen. CCW Contract Science Report 769. Countryside Council for Wales, Bangor, 174pp + iii.</p> <p>Bunker FStPD. 2011. Monitoring of a Maerl Bed in the Milford Haven Waterway, Pembrokeshire, 2010. CCW Contract Science Report No. 979. A report to the Countryside Council for Wales by MarineSeen, Pembrokeshire 145pp + iii.</p> <p>Bunker, F. St. P. D., Diaz-Tapia, P. and Maggs, C. A. (in prep). Monitoring a maerl bed in Milford Haven between 2005 and 2016. NRW Evidence Report No: 213, Natural Resources Wales, Bangor</p> <p>Duggan-Edwards M, Brazier DP. 2015. Intertidal SAC monitoring <i>Zostera noltii</i> in Angle Bay, Pembrokeshire Marine SAC 2013. NRW Evidence Report No: 55, 38pp</p>

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- + 'xi, Natural Resources Wales, Bangor.
- Duigan CA, Rimington NA, Howe, MA. (Eds). 2014. Coastal storms December 2013 & January 2014 - an assessment of environmental change. Natural Resources Wales Evidence Report No: 33, 122pp, Natural Resources Wales, Bangor.
- Edwards P. 2014. Nutrient concentrations in the Milford Haven catchment area. Tech. memo: TMW14-09 Natural Resources Wales. NRW.
- Environment Agency. 2011. Environment Agency Appropriate Assessment: Pembroke Power Station Environmental Permit.
- Environment Agency. 2013. (Shellfish) Waterbody Action Report, Burry Inlet (South) Draft. Shellfish Waters Investigation Project.
- European Commission (1992) The Habitats Directive (1992)  
[http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index\\_en.htm](http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm)
- European Commission (2000) The EU Water Framework Directive  
[http://ec.europa.eu/environment/water/water-framework/index\\_en.html](http://ec.europa.eu/environment/water/water-framework/index_en.html)
- European Commission (2008) The Marine Strategy Framework Directive  
<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056>.  
[http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/index\\_en.htm](http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/index_en.htm)
- European Commission (2014) The Common Fisheries Policy (CFP)  
[https://ec.europa.eu/fisheries/cfp\\_en](https://ec.europa.eu/fisheries/cfp_en)
- Gall SC, Thompson RC. 2015. The impact of debris on marine life. Mar Pol Bull 92: 170-179.
- Galloway TS, Lewis CN. 2016. Marine microplastics spell big problems for future generations. PNAS vol. 113 No. 9: 2331-2333.
- Garrett HM. 2016. Afon Teifi SAC population attribute condition assessment for brook, river and sea lamprey population 2014. NRW Evidence Report No. 106. 28 pp. NRW. Bangor.
- Haines I, Edwards P. 2016. Evidence Review of the Trophic Status of the Milford Haven Waterway. NVZ review, Natural Resources Wales.
- Halcrow Group. 2012a. SMP 22 Great Ormes Head to Scotland (North West England and North Wales) Shoreline Management Plan SMP2. Available from: [http://www.allerdale.gov.uk/downloads/nw\\_shoreline\\_management\\_plan\\_2.pdf](http://www.allerdale.gov.uk/downloads/nw_shoreline_management_plan_2.pdf)
- Halcrow Group. 2012b. SMP 20 Lavernock Point to St Ann's Head (South Wales) Shoreline Management Plan SMP2. Available from: [http://www.npt.gov.uk/ldpexamination/SWW03 Shoreline Management Plan 2 Main Document \(2012\).pdf](http://www.npt.gov.uk/ldpexamination/SWW03%20Shoreline%20Management%20Plan%20Main%20Document%20(2012).pdf).
- Hawkins SJ, Sugden HE, Mieszkowska N, Moore PJ, Poloczanska E, Leaper R, Herbert RJH, Genner MJ, Moschella PS, Thompson RC, Jenkins SR, Southward AJ, Burrows MT. 2009 Consequences of climate-driven biodiversity changes for ecosystem, functioning of North European rocky shores. Mar Ecol Prog Series Vol. 396: 245-259
- HEBOG. 2005. Milford Haven Maintenance Dredging Assessment: Biological and sediment characterisation. Report to Milford Haven Port Authority by HEBOG Environmental.
- HM Government (1981) Wildlife and Countryside Act 1981  
<https://www.legislation.gov.uk/ukpga/1981/69/section/14>
- HM Government (1989) Electricity Act 1989 (Section 36)  
<https://www.legislation.gov.uk/ukpga/1989/29/section/36>
- HM Government (2008) Planning Act 2008  
<https://www.legislation.gov.uk/ukpga/2008/29/part/3/crossheading/energy>
- HM Government (2009) Marine and Coastal Access Act 2009

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

<https://www.legislation.gov.uk/ukpga/2009/23/contents>  
HM Government (2010) The Scallop Fishing (Wales) (No.2) Order 2010:  
<http://www.legislation.gov.uk/wsi/2010/269/contents/made>  
HM Government (2010) The Single Use Carrier Bags Charge (Wales) Regulations 2010 <http://www.legislation.gov.uk/wsi/2010/2880/contents/made>  
HM Government (2017) The Conservation of Habitats and Species Regulations 2017 <http://www.legislation.gov.uk/uksi/2017/1012/contents/made>  
HM Government (2017) Wales Act 2017  
<http://www.legislation.gov.uk/ukpga/2017/4/section/39/enacted>  
ICES advice (P. platessa) (2017). Plaice (*Pleuronectes platessa*) in Division 7.a (Irish Sea) <http://www.ices.dk/sites/pub/Publication Reports/Advice/2017/2017/ple.27.7a.pdf>  
ICES advice (P. platessa) (2017). Plaice (*Pleuronectes platessa*) in divisions 7.f and 7.g (Bristol Channel, Celtic Sea) <http://www.ices.dk/sites/pub/Publication Reports/Advice/2017/2017/ple.27.7fg.pdf>  
ICES advice (S. solea) (2016) Sole (*Solea solea*) in Division 7.a (Irish Sea) <http://www.ices.dk/sites/pub/Publication Reports/Advice/2016/2016/sol-iris.pdf>  
ICES advice (S. solea) (2016) Sole (*Solea solea*) in divisions 7.f and 7.g (Bristol Channel, Celtic Sea) <http://www.ices.dk/sites/pub/Publication Reports/Advice/2017/2017/sol.27.7fg.pdf>  
ICES advice (C. harengus) (2017) Herring (*Clupea harengus*) in division 7.a South of 52 degree 30'N, 7.g-h, and 7.j-k (Irish Sea, Celtic Sea, and southwest of Ireland) <http://www.ices.dk/sites/pub/Publication Reports/Advice/2018/2018/her.27.irls.pdf>  
ICES advice (C. harengus) (2017) Herring (*Clupea harengus*) in division 7.a (Irish Sea) <http://www.ices.dk/sites/pub/Publication Reports/Advice/2017/2017/her.27.nirs.pdf>  
ICES advice (D. labrax) (2018) Seabass (*Dicentrarchus labrax*) in divisions 4.b-c, 7.a, and 7.d-h (central and southern North Sea, Irish Sea, English Channel, Bristol Channel, and Celtic Sea) <http://www.ices.dk/sites/pub/Publication Reports/Advice/2018/2018/bss.27.4bc7ad-h.pdf>  
ICES advice (M. merlangus) (2017). Whiting (*Merlangius merlangus*) in Division 7.a (Irish Sea) <http://www.ices.dk/sites/pub/Publication Reports/Advice/2017/2017/whg.27.7a.pdf>  
ICES advice (M. merlangus) (2017). Whiting (*Merlangius merlangus*) in divisions 7.b-c and 7.e-k (southern Celtic Seas and western English Channel) <http://www.ices.dk/sites/pub/Publication Reports/Advice/2017/2017/whg.27.7b-ce-k.pdf>  
IMO. 2014. International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) [http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships%27-Ballast-Water-and-Sediments-\(BWM\).aspx](http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships%27-Ballast-Water-and-Sediments-(BWM).aspx)  
Jacobs. 2017. Pembroke Environmental Monitoring. Intertidal Rocky Shore Communities 2016. Report to RWE Generation Plc. JUKL/B1810700/R48  
Jarvis AP, Davis JE, Gray ND, Orme PHA, Gandy CJ. 2014. Mitigation of pollution from abandoned metal mines. Environment Agency Science Report - SC090024/R3  
Jones BL, Unsworth RKF. 2016. The perilous state of seagrass in the British Isles. Royal Society Open Science.  
Jones D, Bain V, Dawson S, Watt T. 2011. Assessing the vulnerability of marine habitats in Wales to the impacts of climate change. CCW contract science reports. Report No 969, 192pp, CCW,

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

- Kay P, Dipper F. 2009. A Field Guide to the Marine Fishes of Wales and Adjacent Waters.
- Lallias D, Boudry P, Batista FM, Beaumont A, King JW, Turner JR, Lapegue S. 2015. Invasion genetics of the Pacific oyster *Crassostrea gigas* in the British Isles inferred from microsatellite and mitochondrial markers. *Biol Invasions* (2015) 17:2581-2595.
- Langston WJ, O'Hara S, Davey M, Pope ND, Shortridge E, Imamura M, Harino H, Kim A, Vane CH. 2012. Bioaccumulation surveillance in Milford Haven Waterway Phase II (2010). A report to the Milford Haven Waterway Environmental Surveillance Group from the Marine Biological Association of the UK.
- Lewis H. 2011. CCW SAC Monitoring Report, UK0013117 Pen Llyn a'r Sarnau SAC Monitoring Report 2011: H1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritima*), H1310 *Salicornia* and other annuals colonising mud and sand.
- Lindenbaum C. 2018. S1376 & S1377 Maerl species 2019 Article 17 report WALES. Natural Resources Wales, Bangor.
- Little DD. 2009. Sediment contaminants and transport review. A report to the Milford Haven Waterway Environmental Surveillance Group. 368pp + appendices
- Lough N, Robinson KA, Ramsay K, Tavner D. 2017. Mapping for Management and Conservation of Subtidal Habitats. Poster Natural Resources Wales.
- Lush C. 2014. Modelling Sensitivity of Seabed Habitats to Combined Fishing Effects. NRW Evidence Reports Report No: 03/14, 53pp, Natural Resources Wales, Bangor
- Manuel Nicolaus EE, Barry J. 2015. Imposex in the dogwhelk (*Nucella lapillus*): 22-year monitoring around England and Wales. *Environ Monit Assess* (2015) 187:736).
- Mercer TS. 2011. Across-Wales intertidal SAC monitoring, Pen Llyn a'r Sarnau SAC July 2010. CCW Marine. Monitoring Report No: 88, pp 70 + vii, Aquatic Survey & Monitoring Ltd. Bollihope, Co. Durham.
- Mercer TS. 2013. Intertidal SAC monitoring, Pen Llyn a'r Sarnau SAC July 2012. CCW Marine Monitoring Report No: 102, pp 68 + x, Aquatic Survey & Monitoring Ltd. Bollihope, Co. Durham.
- Mercer TS. 2016a. Intertidal monitoring, Pen Llyn a'r Sarnau SAC August 2013. NRW Evidence Report No. 58, pp 67 + x, Natural Resources Wales, Bangor.
- Mercer TS. 2016b. Across-Wales intertidal SAC monitoring, Pen Llyn a'r Sarnau SAC August 2014. NRW Evidence Report No: 75, pp 95 + vii, Aquatic Survey & Monitoring Ltd. Harehope Quarry, Co. Durham.
- Mieszkowska N. 2011a. MarClim Annual Welsh Intertidal Climate Monitoring Survey 2010. Report to Countryside Council for Wales. CCW Science Report No 962.
- Mieszkowska N. 2011b. Reestablishment of intertidal rocky surveillance. A report to the Milford Haven Waterway Environmental Surveillance Group from the Marine Biological Association of the UK. 54pp + appendices.
- MMO. 2016. UK Sea Fisheries Statistics. [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/647482/UK\\_Sea\\_Fisheries\\_Statistics\\_2016\\_Full\\_report.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/647482/UK_Sea_Fisheries_Statistics_2016_Full_report.pdf)
- Moore, J.J. 2009a. Surveys of cockle and mussel stocks in the Burry Inlet, 2004 to 2008. CCW Marine Monitoring Report No: 34, 51pp + iv.
- Moore, J.J. 2009b. Surveys of cockle and mussel stocks in the Burry Inlet, 2009. A report to the Countryside Council for Wales from Coastal Assessment, Liaison & Monitoring., Coshaston, Pembrokeshire. 19 pp + iv
- Moore J. 2012. Surveys of cockle and mussel stocks in the Burry Inlet, 2009. CCW Marine Monitoring Report No: 99, 36pp + iv, CCW, Bangor
- Moore J. In prep a. Cardigan Bay SAC field intertidal monitoring, 2009 to 2017.

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

- NRW Evidence Report No: xxx, vi + 62pp, Natural Resources Wales, Bangor.
- Moore J. In prep b. Menai Strait and Conwy Bay SAC intertidal monitoring, 2010 to 2016. NRW Evidence Report No: xxx, ix + ?pp, Natural Resources Wales, Bangor.
- Moore, J. and Mercer, T. in prep. Monitoring Survey of Maerl in Milford Haven Waterway 2017. NRW Evidence Report No: 288, 26pp, Natural Resources Wales, Bangor.
- Nelms SE, Coombes C, Foster LC, Galloway TS, Godley BJ, Lindeque PL, Witt MJ. 2017. Marine anthropogenic litter on British beaches: a 10-year nationwide assessment using citizen science data. *Sci. Total Environ.* 579, 1399-1409.
- NRW. 2013. H1130 Estuaries 2013 Article 17 report WALES. Natural Resources Wales, Bangor.
- NRW. 2014. Environmental Pressures on the Milford Haven Waterway. Report No. A&R/SW/14/1. Natural Resources Wales. Cardiff
- NRW. 2015. Natura 2000 Thematic Action Plan: Marine Fisheries
- NRW. 2017. NRW Actions Database. Internal data source
- NRW. 2018a. Indicative feature condition assessments for European marine sites (EMS). [Online]. Available from: <https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/find-protected-areas-of-land-and-seas/indicative-feature-condition-assessments-for-european-marine-sites-ems/?lang=en>
- NRW. 2018b. Dee Estuary / Aber Dyfrdwy Special Area of Conservation: Indicative site level feature condition assessments 2018. NRW Evidence Report Series, Report No: 229, 35pp, NRW, Bangor
- NRW. 2018c. Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh Special Area of Conservation: Indicative site level feature condition assessments 2018. NRW Evidence Report Series, Report No: 225, 29pp, NRW, Bangor.
- NRW. 2018d. Y Fenai a Bae Conwy / Menai Strait and Conwy Bay Special Area of Conservation: Indicative site level feature condition assessments 2018. NRW Evidence Report Series, Report No: 232, 33pp, NRW, Bangor.
- NRW. 2018e. Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau Special Area of Conservation: Indicative site level feature condition assessments 2018. NRW Evidence Report Series, Report No: 234, 58pp, NRW, Bangor.
- NRW. 2018f. Pembrokeshire Marine / Sir Benfro Forol Special Area of Conservation: Indicative site level feature condition assessments 2018. NRW Evidence Report Series, Report No: 233, 67pp, NRW, Bangor.
- NRW. 2018g. Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd Special Area of Conservation: Indicative site level feature condition assessments 2018. NRW Evidence Report Series, Report No: 227, 49pp, NRW, Bangor.
- NRW. 2018h. Severn Estuary / Mor Hafren Special Area of Conservation: Indicative site level feature condition assessments 2018. NRW Evidence Report Series, Report No: 235, 41pp, NRW, Bangor.
- NRW. 2018i. 2013-2018 supporting evidence pack for Annex B & D feature reports. H1330 Atlantic Salt Meadow.
- NRW. 2018j. 2013-2018 supporting evidence pack for Annex B & D feature reports. H1310 Salicornia and other annuals colonising mud and sand.
- Pauls L. 2017. Carmarthen Bay and Estuaries SAC Atlantic Salt Meadows SAC Monitoring Report. NRW Evidence Report 222.
- Pears S. in prep. Milford Haven inlets infauna, sediment particle size and chemistry monitoring report. NRW Evidence Report No xx. Pp xx + xx. APEM.
- Prosser MV, Wallace HL. 1998. Taf, Tywi and Gwendraeth saltmarsh survey (Burry Inlet cSAC), 1997. CCW Contract Science Report No. 293.
- Prosser MV, Wallace HL. 1999. Burry Inlet and Loughor Estuary SSSI, NVC Survey

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

1998. CCW Contract Science Report No. 376.

Royal Haskoning. 2012. SMP 21 St Ann's Head to Great Ormes Head (West of Wales) Shoreline Management Plan 2. Available from: <http://www.westofwalesmp.org/>.

Sambrook K, Griffith K, Jenkins SR. 2014. Review of Monitoring of Marine Non-native Species in Great Britain and Evaluation of Gaps in Data Dissemination. NRW Evidence Series. Report No: 20, 36 pp, NRW, Bangor.

Seafish. 2017. Wales Seafood Industry Dashboard 2017

Strachan R. 2015. Otter Survey of Wales. Natural Resources Wales. Published by Natural Resources Wales. <https://naturalresources.wales/evidence-and-data/research-and-reports/wales-otter-report-2009-10/?lang=en>

Thomas R. 2014. Diffuse Water Pollution in Wales. Issues, solutions and engagement for action. Natural Resources Wales. Cardiff. Accessed 29/09/2015 <https://naturalresources.wales/media/4059/diffuse-water-pollution-in-wales.pdf>

Webb H, Teague N, Hatton-Ellis TW, Garrett H. 2013. Lamprey monitoring on the Afon Teifi Special Area of Conservation (SAC) 2012/13. CCW Contract Science Report No. 1040.

Welsh Assembly Government (2018) Environmental Protection (Microbeads) (Wales) Regulations 2018 was voted on and passed by the Welsh Assembly in June 2018 [http://www.assembly.wales/laid\\_documents/sub-ld11558-em/sub-ld11558-em-e.pdf](http://www.assembly.wales/laid_documents/sub-ld11558-em/sub-ld11558-em-e.pdf)

Welsh National Marine Plan (draft). 2018. <https://beta.gov.wales/draft-welsh-national-marine-plan>.

Wilkinson K, Anstice S. 2018. Severn Estuary SAC Monitoring Dataset. Internal NRW Dataset.

Wood CA, Bishop JDD, Yunnie A. 2015. Comprehensive Reassessment of NNS in Welsh marinas. Welsh Government Resilient Ecosystems Fund Report.

Woolmer AP, Syvret M, FitzGerald A. 2011. Restoration of native oyster, *Ostrea edulis*, in South Wales: Options and approaches. CCW Contract Science Report No: 960, 93 pp.

Wyn G, Brazier P, Birch K, Bunker A, Cooke A, Jones M, Lough N, McMath A, Roberts S. 2006. Handbook for the marine intertidal phase 1 biotope mapping survey. ISBN: 1 86169 144 0

zu Ermgassen PSE. 2017. Milford Haven Native Oyster Regeneration Project - Stage One (current status and practicalities). A report commissioned by West Wales Shellfisherman's Association Ltd. supported by the Milford Haven Native Oyster Regeneration Management Group. pp54.

## 4. Range

4.1 Surface area (in km <sup>2</sup> )	590.44
4.2 Short-term trend Period	
4.3 Short-term trend Direction	Stable (0)
4.4 Short-term trend Magnitude	a) Minimum <span style="float: right;">b) Maximum</span>
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 <span style="float: right;">b) Maximum</span>
4.9 Long-term trend Method used	
4.10 Favourable reference range	a) Area (km <sup>2</sup> ) b) Operator



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	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	2013-2018		
5.2 Surface area (in km <sup>2</sup> )	a) Minimum 590.44	b) Maximum 590.44	c) Best single value 590.44
5.3 Type of estimate	Best estimate		
5.4 Surface area Method used	Based mainly on extrapolation from a limited amount of data		
5.5 Short-term trend Period	2007-2018		
5.6 Short-term trend Direction	Stable (0)		
5.7 Short-term trend Magnitude	a) Minimum	b) Maximum	c) Confidence interval
5.8 Short-term trend Method used	Based mainly on extrapolation from a limited amount of data		
5.9 Long-term trend Period	1995-2018		
5.10 Long-term trend Direction	Decreasing (-)		
5.11 Long-term trend Magnitude	a) Minimum	b) Maximum	c) Confidence interval
5.12 Long-term trend Method used	Based mainly on extrapolation from a limited amount of data		
5.13 Favourable reference area	a) Area (km <sup>2</sup> )		
	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 (km <sup>2</sup> )	Minimum 11.19	Maximum 11.19
	b) Area in not-good condition (km <sup>2</sup> )	Minimum 506.26	Maximum 506.26
	c) Area where condition is not known (km <sup>2</sup> )	Minimum 72.99	Maximum 72.99
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)		

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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
Mixed source marine water pollution (marine and coastal) (J02)	H
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)	H
Agricultural activities generating marine pollution (A28)	H
Residential or recreational activities and structures generating marine pollution (excl. marine macro- and micro-particular pollution) (F20)	M
Marine fish and shellfish harvesting (professional, recreational) causing reduction of species/prey populations and disturbance of species (G01)	M
Development and operation of energy production plants (including bioenergy plants, fossil and nuclear energy plants) (D05)	M
Other human intrusions and disturbance not mentioned above (H08)	M
Residential or recreational activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam) (F22)	M
Intensive grazing or overgrazing by livestock (A09)	M
Shipping lanes, ferry lanes and anchorage infrastructure (e.g. canalisation, dredging) (E03)	M
Threat	Ranking
Mixed source marine water pollution (marine and coastal) (J02)	H
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)	H
Agricultural activities generating marine pollution (A28)	H
Residential or recreational activities and structures generating marine pollution (excl. marine macro- and micro-particular pollution) (F20)	M

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Marine fish and shellfish harvesting (professional, recreational) causing reduction of species/prey populations and disturbance of species (G01)	M
Residential or recreational activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam) (F22)	M
Other invasive alien species (other than species of Union concern) (I02)	M
Intensive grazing or overgrazing by livestock (A09)	M
Industrial or commercial activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam) (F23)	M
Sea-level and wave exposure changes due to climate change (N04)	M

## 7.2 Sources of information

## 7.3 Additional information

# 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	Medium-term results (within the next two reporting periods, 2019-2030)	
8.5 List of main conservation measures		

Reduce impact of mixed source pollution (CJ01)
Habitat restoration of areas impacted by residential, commercial, industrial and recreational infrastructure, operations and activities (CF02)
Reduce/eliminate marine pollution from agricultural activities (CA13)
Reduce/eliminate marine pollution from industrial, commercial, residential and recreational areas and activities (CF07)
Manage changes in hydrological and coastal systems and regimes for construction and development (CF10)
Implement climate change adaptation measures (CN02)
Adapt mowing, grazing and other equivalent agricultural activities (CA05)
Management of professional/commercial fishing (including shellfish and seaweed harvesting) (CG01)
Reduce/eliminate marine contamination with litter (CF08)
Management, control or eradication of other invasive alien species (CI03)

## 8.6 Additional information

# 9. Future prospects

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

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 km <sup>2</sup> in biogeographical/marine region)	a) Minimum	555.2
	b) Maximum	555.2
	c) Best single value	555.2

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**

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

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

# Distribution Map

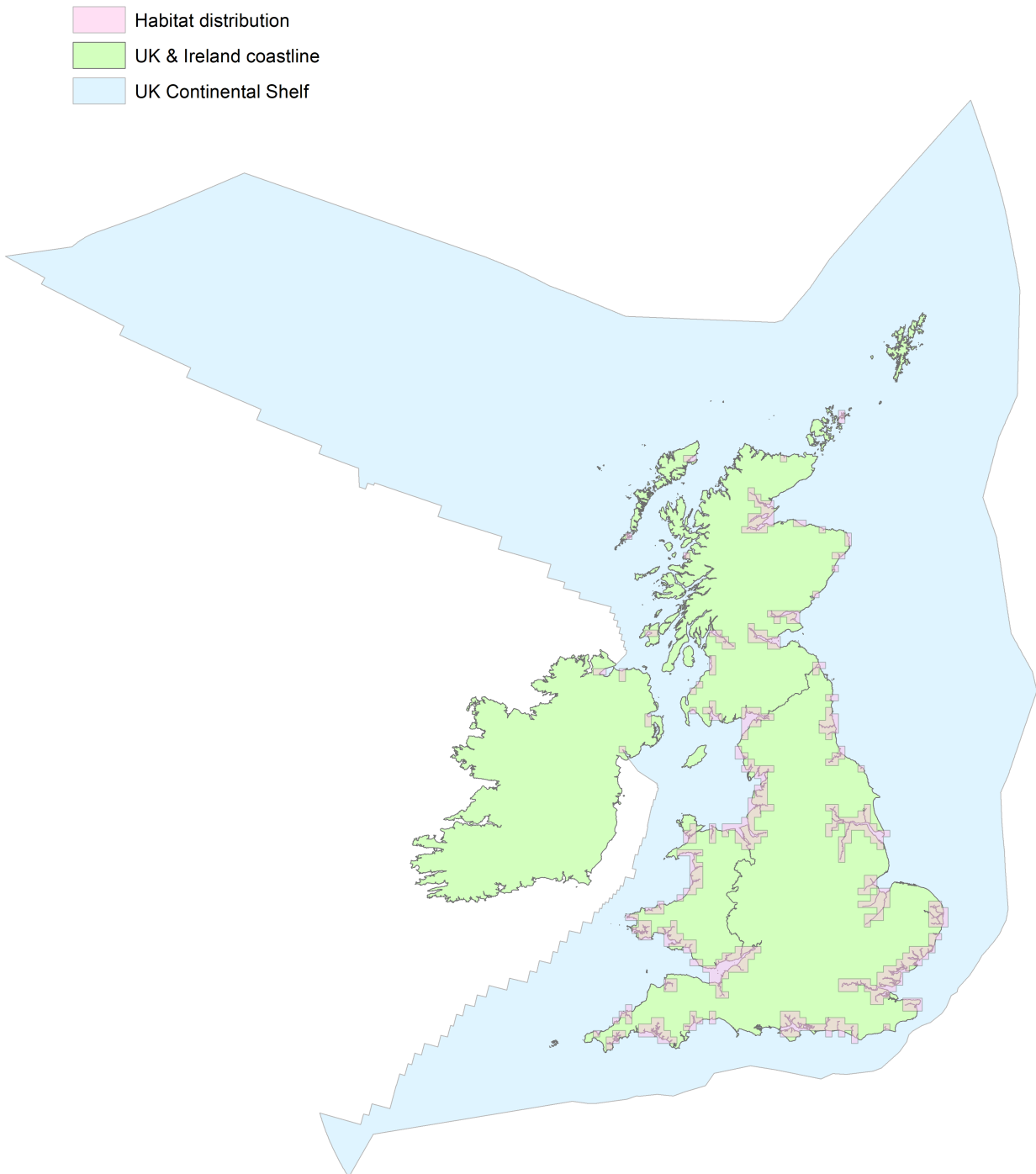


Figure 1: UK distribution map for H1130 - Estuaries.

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

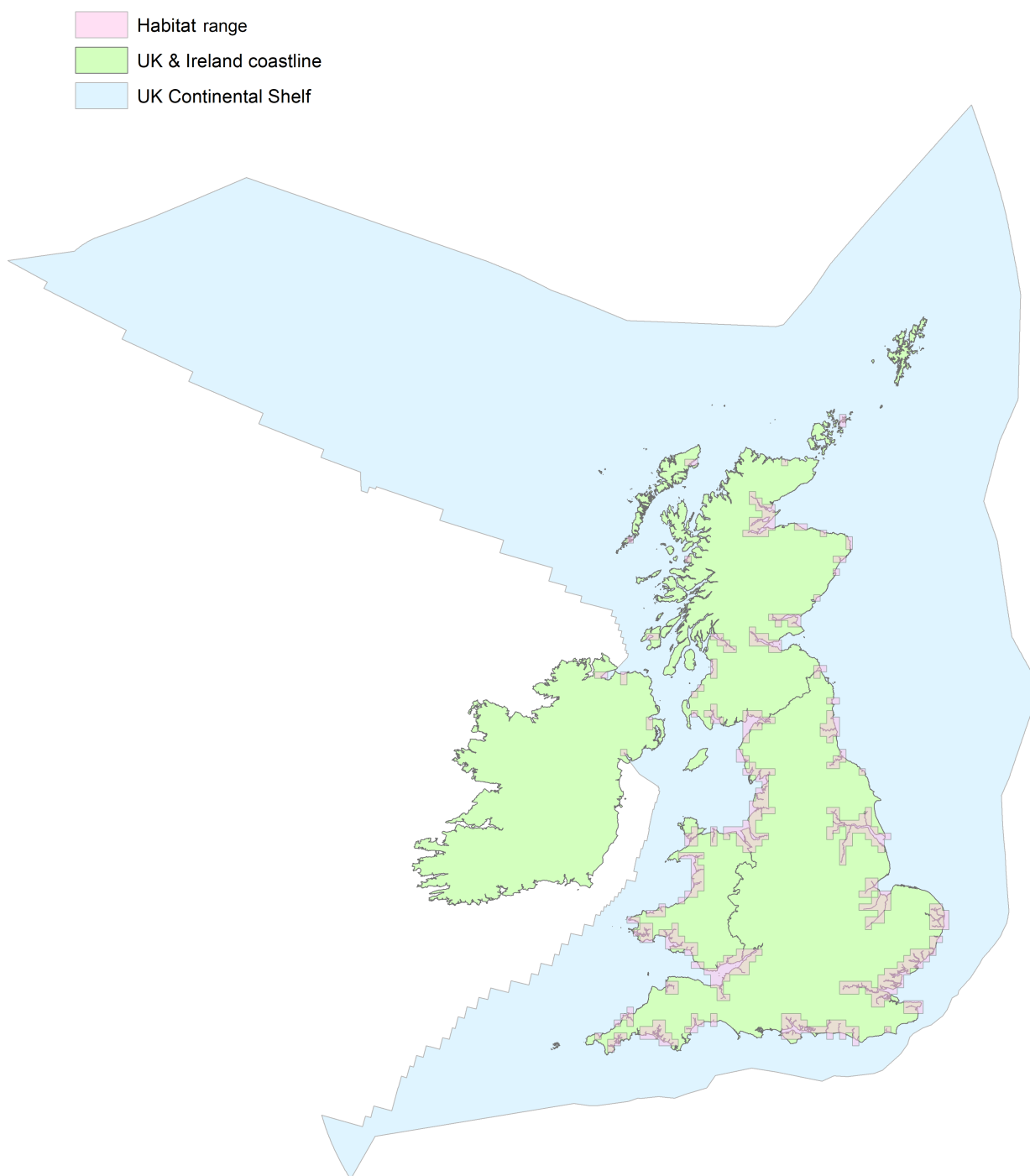


Figure 2: UK range map for H1130 - Estuaries.

Estuaries are physiographic features and so their range is determined primarily by geomorphological and hydrographic processes occurring over geological time-scales and is not related to biological communities or processes supported by communities. Therefore, the range was considered equivalent to the surface area (distribution) of the habitat.

# Explanatory Notes

## Habitat code: 1130

Field label	Note
2.1 Year or period	The range map for estuaries was originally derived from NRW's Intertidal Phase I survey (1996 - 2005) (Wyn et al., 2006), a variety of saltmarsh surveys and from a variety of sources, including JNCC, BGS and NRW mapping work (Lough et al., 2017). The intertidal survey covered all Welsh shores, and whilst the data was gathered over several years and small localised changes are bound to have occurred, the data set provides a comprehensive broadscale map of habitat distribution and extent in estuaries across Wales. Confidence in the mapped values is good, though it should be recognised that localised natural habitat changes and the height of the tide on the day a shore was visited will affect the accuracy of the value. Not all estuarine habitats are included in the mapped layer, resulting in 12 small estuaries not being accounted for in the mapped layer. These should be accounted for in the future. As a physiographic feature, the boundary is not precisely aligned with the features or sub-features of the estuary. See Brazier & Robinson (2018) - 'Article 17 GIS processing notes Estuaries' for full details.

## Habitat code: 1130 Region code: MATL

Field label	Note
4.3 Short term trend; Direction	Boundaries for Estuaries are based on physiographic features and are therefore unlikely to change, unless there is substantial shift in geomorphology. Some of the losses in intertidal Mudflats and Sandflats (H1140) are within Estuaries, but the overall range of the Estuary remains the same. Stable indicated in 2013 (although minor losses indicated due to coastal defence).
5.1 Year or period	As a physiographic feature, the boundary is not precisely aligned with the features or sub-features of the estuary. Boundaries were developed from maps derived from CCW's Phase I intertidal mapping survey Wyn et al. (2006), and subtidal areas, identified from a variety of sources, including JNCC, BGS and NRW mapping work (Lough et al., 2017). Full details are given in Brazier & Robinson (2018).
5.2 Surface area	590.44 km <sup>2</sup> (JNCC value) (2013 Area = 591.91 km <sup>2</sup> ) The total area of Estuary in Wales is calculated as being in excess of 590 km <sup>2</sup> , with the exact figure varying somewhat due to differences in the map projection or other methodological changes: in 2018 JNCC calculated the total area in Wales as being 590.44 km <sup>2</sup> , in comparison to a the previous (2013) estimate of 591.91km <sup>2</sup> , while NRW's internal 2018 estimate (based on the same underpinning data) suggest a total area of 595.31km <sup>2</sup> .. The origin of the difference between 2013 and 2018 values is unclear, but possibly due to changes in managing the data using the GIS
5.4 Surface area; Method used	See Brazier & Robinson (2018) - Article 17 GIS processing notes Estuaries for full details.
5.6 Short term trend; Direction	Boundaries for Estuaries are based on physiographic features and are therefore unlikely to change, unless there is substantial shift in geomorphology. Some of the losses in intertidal Mudflats and Sandflats (H1140) are within Estuaries, but the overall area of the Estuary remains the same.
5.8 Short term trend; Method used	See Brazier & Robinson (2018) - Article 17 GIS processing notes Estuaries for full details.
5.10 Long term trend; Direction	There have been some significant recorded estuary habitat losses in the past (e.g. Cardiff Bay barrage, river Neath).



5.11 Long term trend; Magnitude	Insufficient available data to generate magnitude values.
5.12 Long term trend; Method used	See Brazier & Robinson (2018) - Article 17 GIS processing notes Estuaries for full details.
5.14 Change and reason for change in surface area	The total area of Estuary in Wales is calculated as being in excess of 590 km <sup>2</sup> , with the exact figure varying somewhat due to differences in the map projection or other methodological changes: in 2018 JNCC calculated the total area in Wales as being 590.44 km <sup>2</sup> , in comparison to a the previous (2013) estimate of 591.91km <sup>2</sup> , while NRW's internal 2018 estimate (based on the same underpinning data) suggest a total area of 595.31km <sup>2</sup> .. The origin of the difference between 2013 and 2018 values is unclear, but possibly due to changes in managing the data using the GIS

## 6.1 Condition of habitat

The area in good/not good/unknown condition of structure and function was assessed using collated available evidence. Data came from: NRW's intertidal and subtidal monitoring programme, WFD waterbody assessments and underpinning information, casework records and associated monitoring, Milford Haven Waterway Environmental Surveillance Group (MHWESG), other contextual information. Monitoring in SAC estuaries typically comprises one or more of the following: - subtidal sediment macrobenthos sampling, - in situ diver recording (reefs), - remote sensing - drop down video, sidescan, automatic identification system (AIS) for shipping - intertidal sediment macrobenthos sampling and in situ monitoring of reef and sediment habitats - intertidal monitoring of specific species e.g. shellfish. The proportions of Good / not good is comparable with reporting in 2013 - 2013 - Good = 6.89 km<sup>2</sup>, Not Good = 585.02 km<sup>2</sup>. Evidence used included data from intersecting WFD waterbody classification. Where an intersecting waterbody status, for either ecology or chemistry, was less than 'good' the structure and function of this feature were assessed as 'unfavourable' e.g. WFD waterbodies that fail for TBT, BDPE and other pollutants (water sampling) are unfavourable, since a fail for a determinand under WFD is deemed to be of ecological significance. Waterbody boundaries do not reflect coastal processes, sediment cells or hydrography. For this reason, the WFD results from a particular sampling location may not be appropriate for the feature in the rest of the waterbody. There has not been the opportunity to verify that a WFD sampling location is appropriate to use for the feature across the spatial extent of the waterbody. For example, extensive tracts of north Cardigan Bay are 'not good' due to mercury levels, but no evaluation has been done to assess the appropriateness of this outcome, since the sampling location is likely to be a long way from some parts of the feature. Low confidence should be associated with applying WFD results to feature condition. Numerous estuaries, such as the Dee estuary and Milford Haven have a moderate DIN under WFD, deemed detrimental to this feature. The Estuary feature is deemed to be Not Good\ where: - There are coastal developments/structures that have the potential to cause habitat loss through coastal squeeze, and/or cause an increase in wave energy and erosion through reflection of waves off structures; - excess macroalgae; - disturbance from bait digging or boat moorings; - dredging or dumping sites; - loss other than natural fluctuations. Additional evidence has been drawn from the NRW indicative condition reports (NRWa - h, 2018). An activity may pass a Habitats Regulations Assessment (HRA), based on there being no adverse effect on site integrity arising from the proposal or plan. However, there are circumstances where the plan is adjusted or the HRA has failed to identify impacts. It is possible that there are negative effects due to incomplete (expected) recovery from disturbances identified in the HRA. Where the HRA has not fully protected the features of a SAC, then further action is being undertaken to rectify this, which will result in future reporting being more favourable. Levels of litter have not been used in the assessment condition, since there is currently not enough evidence to conclude that they are having an ecologically significant impact the condition of the feature. Habitats Directive monitoring (grab samples) in Milford Haven Inlets over intertidal areas show significant community change where samples have been in areas with excessive macroalgae (SAC monitoring 2015 - NRW, 2018f). Infaunal analysis of intertidal sediment core and grab samples consisted predominantly of multivariate statistics of biota and sediment granulometry in conjunction with consideration of natural and anthropogenic influences that may explain observed changes. The estuaries in Pen Llyn a'r Sarnau continue to be low diversity, sandy estuaries, which have not shown any changes in condition (Mercer, 2011, 2013, 2106a, b). In these estuaries, part of the conservation objective is 'should be restored' for the estuary feature, this means that at the time the conservation objectives were set, the estuary feature was likely to be in unfavourable condition. This also affects the mudflats and sandflats feature as it is within the estuary feature and is therefore included within the objective. In the absence of progress towards these objectives, the estuaries will remain as unfavourable. Significant community changes, in some cases unfavourable, were noted

from grab sampling, e.g, Milford Haven Estuary maerl bed (Bunker & Camplin 2007; Bunker 2011; Lindenbaum, 2018; NRW, 2018f) and muddy inlets, whilst IQI scores for subtidal samples in many estuaries were scored 'not good' (though confidence was often low). Significant on-going impacts to seagrass beds were recorded at several sites: impacts from cockle raking, vehicle access and bait digging are present at Angle Bay (Duggan-Edwards & Brazier, 2015) Monitoring of estuarine reef habitats in the Milford Haven show fluctuations in species dominance, but these appear to be natural variation (Bunker & Brazier, 2013; Bunker 2015). Surveillance of non-native species has recorded a significant increase in *Sargassum muticum* and an expansion of *Crepidula fornicata* within Milford Haven. Increasing *Crepidula* numbers have been recorded within the estuary's maerl bed, and *Sargassum* is becoming very dominant in areas of mixed ground. *Magallana (Crassostrea) gigas* may be self-recruiting within the estuary (to be confirmed) (Lallias et al., 2015). Milford Haven is a hot spot, with a high UK diversity of non-natives being present (Mieszkowska, 2011a). ICES advice for typical estuary fish species, where available, has been reviewed. This includes those species with populations that are declining or of reduced breeding capacity. Whilst the information held in the ICES assessments provides some wider context, there is very little evidence of the actual removal of these typical species from the vicinity of Welsh marine features and there is a lack of evidence that suitable fisheries overlap the marine features in Welsh waters or occur in Welsh waters. The information available demonstrates that there is a lack of fisheries data that could be used in the assessment and that the available data are of low confidence. Effects of fishing on the Estuary feature have not been considered in the assessment of condition of feature. Saltmarsh forms part of the estuarine habitat. The condition of Atlantic Salt Meadow in Wales is generally unfavourable and faces a significant threat from water quality issues and coastal squeeze. The only ASM in favourable condition is the Dee esuary. The *Salicornia* feature is unfavourable in half of the 4 estuary features that include it. Saltmarshes are unfavourable due to water quality, grazing, coastal squeeze and constraints on full development of zonation across the marsh (NRW, 2018 a-j). Sea and river lampreys, allis and twaite shad are unfavourable in most estuaries (exceptions being Cardigan Bay lamprey and Pembrokeshire Marine shad) due to water quality issues (NRW, 2018 a-h). Otter are favourable in 3 of the 4 estuaries in which they are a sub-feature (NRW, 2018 a-h).

6.4 Short term trend of habitat area in good condition; Direction

The proportions of feature in good / not good condition is approximately the same as previously. The outcomes of the WFD classifications are much the same, with small variations accounting for changes. 2013 values: Good = 6.89 km<sup>2</sup>, Not Good = 585.02 km<sup>2</sup>.

## 7.1 Characterisation of pressures/ threats

J02 - Mixed source marine water pollution (marine and coastal) Pressure: high; Threat: high There is an assortment of sources of pollution into the marine environment that are difficult to quantify and apportion. Estuaries typically have raised levels of nutrients and contaminants. All estuarine examples of the feature fail due to the presence of WFD chemical or biological determinands in the waterbody. TBT levels are reducing but pressure from use of antifoulants on recreational boats and commercial shipping is still present. Waterbody failures due to diffuse nutrients affect some estuaries, particularly Milford Haven Waterway (NRW, 2014), Carmarthen Bay and Y Foryd (NRW, 2013; Edwards, 2014; Haines & Edwards, 2016). In Milford Haven Waterway this is resulting in raised levels of suspended silt, silt deposition and increased plant growth. Raised turbidity and silt deposition is likely to be affecting algae, whilst dense and widespread macroalgae overlying sediment flats is having negative consequences for sediment biota and generating eutrophication and smothering impacts when it is washed up on the strandlines, sediment flats, reefs and saltmarsh. Groundwater contamination from the oil industry (and historical hydrocarbon infrastructure) is present in some limited areas (e.g. Milford Haven), typically related to infrastructure failures, accidents and historical wartime events (NRW, 2014). Pollution to groundwater also contributes to diffuse nutrient input.

F08 - Modification of coastline, estuary and coastal conditions for development, use and protection of residential, commercial, industrial and recreational infrastructure and areas (including sea defence or coast protection works and infrastructures). Pressure: High; Threat: High Recorded small losses or modification of habitat are associated with the creation and maintenance of infrastructure along the coast (e.g. Milford Haven Waterway). Creation of private slipways and hard standing on shoreline reef, and maintenance or establishment of shore defences is increasing in areas where housing has water frontage. In some areas the level of dumped construction materials on some shores is significantly changing the nature of the shore. This includes material lost from failed coastal defences (e.g. gabion baskets) and dumping of waste rubble onto shores. There are several areas where these defences are at the end of their useful life and are beginning to disintegrate. In many cases, these activities are illegal, and remediation is being carried out to resolve the inappropriate development. Outside of SACs, there is no requirement for a HRA, such that these activities are not effectively regulated. These activities also affect the hydrological flow within the estuary.

A28 - Agricultural activities generating marine pollution. Pressure: High; Threat: High Waterbody failures due to diffuse nutrients from agriculture affect some estuaries and bays, particularly Milford Haven Waterway (NRW, 2014), Carmarthen Bay and Y Foryd (NRW, 2013; Edwards, 2014; Haines & Edwards, 2016). Diffuse pollution is derived primarily from agricultural activities, resulting in raised levels of nutrient (nitrogen and phosphorus) and sediment run off. In Milford Haven Waterway this is resulting in raised levels of suspended silt, silt deposition and increased plant growth. Raised turbidity and silt deposition is likely to be affecting algae (including maerl) and seagrass, whilst dense and widespread macroalgae overlying sediment flats is having negative consequences for sediment biota and generating eutrophication and smothering impacts when it is washed up on the strandlines, sediment flats, reefs and saltmarsh. There is the possibility that high turbidity and sedimentation has contributed to the dramatic decline in live maerl (over 90% reduction) in the last decade, this is currently being investigated (Bunker & Camplin, 2007; Bunker, 2011; Bunker et al., in prep; Moore & Mercer, in prep). High levels of nutrients are reported by Jones & Unsworth (2016) at the *Zostera marina* seagrass bed at Gelliswick. There is an increasing body of evidence potentially linking episodes of poor shellfish hygiene quality and WFD shellfish protected area guideline failures (*E. coli* in shellfish flesh) with livestock (primarily sheep) grazing practices on the marsh in the Burry Inlet (primarily Llanrhidian Marsh). Food Standards Agency (FSA) shellfish hygiene monthly data sets correlate with seasonality of sheep grazing patterns, i.e. low grazing levels and *E. coli* in winter, rising through spring and summer as lambs are growing and declining in autumn as livestock is sent to market. This pattern is counter to expected

river flow or rainfall related CSO spill patterns typically observed in the north of the estuary. Peak E. coli measurements are when the marsh floods during spring tide events. Reports of elevated E. coli in shellfish flesh in the Burry South shellfish beds, have occurred in the summer months around spring tides and saltmarsh inundation, that cannot be attributed to any other pollutant sources other than the saltmarsh. An hydrodynamic model study illustrates impacts of wash off from the marsh and its likely impact on shellfish beds in the proximity of North Gower (Burry South shellfish harvesting areas). What is still uncertain is the relative scale of the various sources (diffuse including the marsh and point sources mostly water company assets) (Environment Agency, 2013; Abu-Baker et al., 2017; Ahmadian et al., 2016). F20 - Residential or recreational activities and structures generating marine pollution (excl. marine macro- and micro- particulate pollution). Pressure: Medium; Threat: Medium Available nutrient levels, contaminants in sediments and/or poor water quality is present in several locations. Sewage discharges and storm water overflow are associated with population centres and below 'Good' WFD waterbody assessments tend to reflect this. Observations of sewage litter (see F22) in certain estuaries is a clear indication of storm overflows operating. G01 - Marine fish and shellfish harvesting (professional, recreational) causing reduction of species/prey populations and disturbance of species Pressure: Medium; Threat: Medium Commercial shell fisheries are active in some areas and include winkle picking (with associated boulder turning and ecosystem effects) and mussel collection (Reef). Fin fish are a component of Estuary communities. The condition of fish species associated with Estuaries and their sub-habitat (Intertidal Mudflat and Sandflat, Saltmarsh and Reefs) populations (Kay & Dipper, 2009) were considered using available ICES assessments (the area of assessment varies by species) (various ICES reports, 2015-2017). Many of the commercial species were assessed as undefined by ICES usually where there remains insufficient information on which to base substantive advice. Some species were assessed to be fished (fishing mortality) above FPA or Flim reference points (and therefore above that estimated for long term maximum sustainable yield) and/or were assessed to have reduced reproductive capacity at ICES assessment areas encompassing Welsh waters (ICES advice reports, 2016-2017). These included Sole (7.a and 7.f & 7.g), Cod (7.e-k) and Seabass (Divisions 4.b-c, 7.a, and 7.d-h). Other species were assessed to be harvested sustainably. The spawning stock biomass of some of these species were also estimated to be notably reduced (e.g. sole [7.a and 7.f & 7.g], where reductions were observed in spawning stock biomass estimates over the past 40-50 years). Because of a marked decline in the UK; both whiting and sole species were included on the Welsh Biodiversity Action Plan (BAP) list and subsequently on the Environment Act (2016) Priority Species List and are therefore of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales (covered under Section 7, Environment (Wales) Act 2016; JNCC BAP reports, 2010). Some commercial elasmobranch species were assessed to be 'unknown' by ICES but 'Near Threatened' by the IUCN (blonde ray, thornback ray and small eyed ray assessments) (IUCN website, accessed 2018) in European waters. For the rays this related to estimated long-term or short-term declines in population and/or range in the north east Atlantic. Fisheries are consistently identified as a threat to rays, however, it should be noted that recent data produced by ICES shows variable recent stock size indications (blonde ray = no info, thornback = increasing trend since 1994, small eyed ray = below average in recent years but recently increased) (ICES advice reports, 2016). It should be noted that the Welsh fishing fleet currently consists of mainly <10m vessels (MMO, 2016) which concentrate mainly on shellfish fishing (Seafish, 2017). Whilst the information held in the ICES assessments provides some wider context, there is limited evidence at a Welsh level of the actual removal of these typical species from the vicinity of Welsh marine features and there is a lack of evidence that suitable fisheries overlap the marine features in Welsh waters or occur in Welsh waters. The information available demonstrates that there is a lack of fisheries data that could be used in the

assessment and that the available data are of low confidence. Effects of fishing on the Estuary feature have not been considered in assessment of the condition of the feature. D05 - Development and operation of energy production plants (including bioenergy plants, fossil and nuclear energy plants). Pressure: medium; Threat: medium but not going to JNCC The extent of the effects of power stations in intertidal sediments of the estuary is considered relatively localised. Thermal impacts from the discharged cooling water at Pembroke Power station are being monitored. Other than direct localised impacts around the point of discharge, there is at present no evidence of significant thermal impacts from this source. Unpublished data suggest a decline in *Patella* sp on shores adjacent to the outfall - the causation is yet to be elucidated (Brazier, in prep). Wider impacts are currently unknown due to the limitations of the monitoring program (Jacobs, 2016). The levels of clupeids such as herring and demersal species such as gobies that have become entrained or impinged in the cooling water system at Pembroke Power station are higher than was predicted in the Environmental Statement prepared for the Habitats Regulation Assessment. The significance of this is uncertain. There is no evidence for effects on mortality and reduced survival of typical species, such as larval and juvenile vertebrates and invertebrates through their impingement and entrainment; biocide or heated water (NRW, 2018f). F22 - Residential or recreational activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam). Pressure: medium; Threat: medium Marine macro-pollution such as plastic bags and other residential litter is often found entangled in sessile reef biota and depositional areas in estuaries. There is an increasing trend in marine litter on Welsh beaches (Nelms et al., 2017; MCS BeachWatch Wales Data 1996-2012.xls). In general, the key physical impact of litter is likely to be linked to ingestion of plastic. Several invertebrate and fish species have been shown to ingest plastic in field and laboratory experiments. Negative (and some negligible) impacts of ingestion of plastic have been observed on marine species but the research on the impacts of litter in the marine environment is in its infancy and impacts are poorly understood (Bergmann et al., 2015; Gall & Thompson, 2015; Galloway & Lewis, 2016). Further assessment of the impacts is required to aid understanding of the extent and the likely impact of litter on the function of infaunal and epifaunal communities and recommendations of any appropriate management action. Monitoring, reporting and method development under MSFD and OSPAR will help increase knowledge and confidence in the future. A09 - Intensive grazing or overgrazing by livestock. Pressure: medium; Threat: medium In the saltmarshes of the estuaries, many issues relating to over grazing are listed within 3 SACs, in the NRW Actions Database. Overgrazing is detrimental to the saltmarsh vegetation structure, creating a uniform short sward where grazing intolerant species are absent. E03 - Shipping lanes, ferry lanes and anchorage infrastructure (e.g. canalisation, dredging) Pressure: medium; Threat: medium but not going to JNCC Milford Haven Waterway supports one of the UK's biggest ports. Investment in port infrastructure generates frequent plans that have had consequences for the ria. Significant amounts of large vessel anchoring and dredging potentially impact Estuary communities through habitat disturbance, siltation and turbidity effects. Further work is required to identify links between silt levels and the various shipping activities. Significant damage to the maerl features within Milford Haven. These activities also affect the hydrological flow within the estuary. As a consequence of low levels of effects of:

- navigational and development related dredging (Milford Haven Waterway);
- land claim associated with marinas (consented), harbour projects, slipways, coastal defences and
- sea walls and significant jetty and harbour wall constructions.

Reductions in extent and quality of the only known Welsh maerl bed in Milford Haven have been observed ((Bunker & Camplin 2007; Bunker 2011; Lindenbaum, 2018; NRW, 2018f)). The maerl bed is subject to raised water turbidity and silt deposition which are

thought to be partly due to capital and maintenance dredging operations. The maerl bed is situated adjacent to areas that have been previously dredged. The Milford Haven Dredging Strategy document (Revision 2) 2016, indicates that according to their multibeam surveys in the region of South Hook there has only been a very small build up in areas above 10m. Multibeam, however, is not a sensitive tool for measuring the sort of changes in sediment composition that would affect the survival of maerl and a small build up may be of significance (Art 17 2018 Maerl Report).

The maerl bed is bisected by a large jetty that was refurbished between 2005-2008. This resulted in impacts on the bed, some of which are evident on the CCW side scan data (2009), for example foot print depressions from jack-up barges and deposition of other construction material. Other impacts included: the deposition of contaminated material - coal tar coverings of piles were shot blasted and this highly toxic material entered the sea below the jetty - the long-term consequences of this are unknown; Large LNG vessels berth at the end of the jetty, adjacent to the bed and a small boat passage concentrates small vessel traffic in shallow water over the northern edge of the bed. The propeller wash from these vessels manoeuvring under the jetty in the shallow water has caused localised deterioration of the bed (Art 17 2018 Maerl Report). Local seagrass is likely to be under similar pressures, however, the water quality may be more of an influence (Jones & Unsworth, 2016)

I02 - Other invasive alien species (other than species of Union concern).

Pressure: low; Threat: medium

Species of significance include *Crepidula fornicata*, *Magallana (Crassostrea) gigas* and *Sargassum muticum* (Bohn, 2014). Modification of habitat and associated community is observable in areas of high density (particularly Milford Haven Waterway). Presence of *C. fornicata* is currently limited to the south and south west coast of Wales. Milford Haven is a hot spot, with a high UK diversity of non-native species being present (Mieszkowska, 2011; Wood et al., 2015). Current aims to increase shellfisheries around Wales comes with the risk of the introduction of species through the aquaculture pathway. Estuaries are best suited for such expansion and are therefore the most vulnerable. The Welsh Government's draft Welsh National Marine Plan identifies potential opportunities for development of shellfisheries across Wales. This is accompanied by appropriate safeguards within Protected Sites, to protect the features, and the draft plan also contains a series of environmental policies that apply throughout Welsh seas that should ensure that all development is sustainable. Where Regulating and Several Orders are applied for, this also provides some safeguards to protect Annex I habitats outside of SACs, although these orders are not compulsory, leaving features under these circumstances under potential threat. The spread of invasive non-native species, such as Pacific oyster *Magallana gigas*, from aquaculture is a risk (Lallias et al., 2015). Localised changes in ambient water temperature in the vicinity of the Pembroke power station may increase the capacity for non-native species to successfully breed and spread within the Milford Haven. F23 - Industrial or commercial activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam). Pressure: low; Threat: medium Marine macro-pollution such as lost fishing gear and industrial derived debris is often found entangled in sessile reef biota and depositional areas in estuaries. There is an increasing trend in marine litter on Welsh beaches (MCS BeachWatch Wales Data 1996-2012.xls). In general, the key physical impact of litter is likely to be linked to ingestion of plastic. Several invertebrate and fish species have been shown to ingest plastic in field and laboratory experiments. Negative (and some negligible) impacts of ingestion of plastic have been observed on marine species but the research on the impacts of litter in the marine environment is in its infancy and impacts are poorly understood (Bergmann et al., 2015; Gall & Thompson, 2015; Galloway & Lewis, 2016). Further assessment of the impacts is required to aid understanding of the extent and the likely impact of litter on the function of infaunal communities and recommendations of any appropriate management action. Monitoring, reporting and method development under MSFD and

OSPAR will help increase knowledge and confidence in the future. N04 - Sea-level and wave exposure changes due to climate change Pressure, low; Threat, medium As a consequence of climate change, changes in abiotic conditions, including sea level rise and wave climate are likely to cause the greatest changes in estuarine sediment morphology and dynamism. Natural patterns of erosion and accretion mean that net losses and gains in the extent of this feature can be difficult to quantify. Many of the Welsh estuaries are infilling with sediment allowing for expansion of the saltmarsh at the expense of intertidal sand and mud. However, losses due to coastal squeeze where habitats are caught between rising sea-levels and fixed defences, are predicted by the Shoreline Management Plans (SMPs) (Atkins 2010, Halcrow 2012(a), Halcrow 2012(b), Royal Haskoning 2012) and Jones et al. (2011). Within the first epoch (2005 to 2025) the SMPs estimate that 331 ha\* of intertidal habitat (including saltmarsh) is predicted to be lost from the SACs within or partially within Wales. The figure for predicted losses for intertidal habitats has not been adjusted for estuary infilling or morphological response to sea level rise and in that context, is seen as a worst-case scenario. The National Habitat Creation Programme (NHCP) has been set up to create compensation habitat to offset intertidal habitat loss due to coastal squeeze caused by coastal defences owned and maintained by Risk Management Authorities in Wales (which includes NRW and Local Authorities). So far, one realignment site has been established as part of this programme with the aim of creating approximately 39 ha of intertidal habitat, (although the majority of this is expected to develop into saltmarsh). However, this site is still developing, and the new features are not yet attributable to Natura 2000 features. Other potential realignment sites around Wales are being progressed. Therefore, the short-term trend in area is likely to be declining due to sea level rise offset and infilling of estuaries, forming into saltmarsh. There is, however, a lack of evidence to confirm this, therefore the direction is listed as uncertain. Temperature changes, flooding and increased precipitation (increasing runoff from land) and changes in acidity due to climate change do not currently have a known effect on the feature. Thermal effects of climate change (N01) are likely to act in combination, with and exacerbate, localised temperature changes associated with power stations due to power station cooling water. \* This figure has been arrived at from the predicted losses set out in the Annexes for the four SMPs which partially or wholly cover Wales. The highest losses predicted are from within the Severn Estuary where 679 ha are predicted to be lost within the first epoch, however only approximately a third of this is from within Wales and the overall figure above has been adjusted to reflect this. No loss is predicted for the Dee which is a cross border site for the first epoch. H08 - Other human intrusions and disturbance not mentioned above. Pressure: Medium; Threat: medium but not going to JNCC In some areas the level of dumped construction materials on some shores is significantly changing the nature of the shore. This includes material lost from failed coastal defences (e.g. gabion baskets) as well as multiple small illegal placement of boulders and waste material. As an unregulated and largely unrecorded activity this is a significant threat to the feature, especially when associated with coastal squeeze from sea level rise.



## 8.5 List of main conservation measures

CJ01 Reduce impact of mixed source pollution Implementation and enforcement of water quality regulation (both marine and freshwater) is ongoing work and is making gains in improving water quality. Management of the wider countryside including the implementation of the River Basin Management Plans by NRW and EA (cross border catchments) is also contributing to improvements (NRW, 2015). Shared multi-agency pollution response plans to deal with major incidences are in place and are regularly updated. Remediation work continues for capturing mine water and removing heavy metal contaminants (Jarvis et al., 2014). Diffuse Water Pollution Thematic Action Plan (TAP) (see below) Marine Litter TAP (see below) CF02 Habitat restoration of areas impacted by residential, commercial, industrial and recreational infrastructures, operations and activities The National Habitat Creation Program (NHCP) has been put in place by the Welsh Government to identify and progress opportunities for managed retreat of the coastline, in order to compensate for predicted losses of intertidal habitats as a result of coastal squeeze. Coastal squeeze occurs where habitats are caught between rising sea-level and man-made structures and are reduced in extent over time. The NHCP provides compensatory habitat for schemes which maintain or upgrade Local Authority or Natural Resources Wales' assets in line with 'Hold The Line' policies within the Shoreline Management Plans. The NHCP does not provide compensatory habitat for coastal squeeze losses in relation to third party assets, and these are considered on a case by case basis (ref: Welsh Government, March 2018. Welsh Government clarification note on the current relationship between the Habitats Directive, the Shoreline Management Plans and the National Habitat Creation Programme. <https://gov.wales/topics/environmentcountryside/epq/flooding/coastal-risk/?lang=en> ) General regulatory framework for assessment of environmental impacts prior to development, plans and projects. 93% of 'Estuaries' feature in Wales is an Annex I feature and protected within the SAC network. Local authority byelaws restricting use of vehicles on the shore. Voluntary management measures were implemented on the Gann flats but were not successful. As a result, a byelaw is being developed in an attempt to reduce the impact of bait digging at this location. Invasive Species and Pathogens TAP (see below) Flood and Coastal Erosion Risk Management TAP (see below) CA13 Reduce/eliminate marine pollution from agricultural activities Implementation and enforcement of water quality regulation (both marine and freshwater) is ongoing work and is making gains in improving water quality. Management of the wider countryside including the implementation of the River Basin Management Plans by NRW and EA (cross border catchments) is also contributing to improvements (NRW, 2015). Shared multi-agency pollution response plans to deal with major incidences are in place and are regularly updated. To further improve understanding of the hydrodynamics and processes relating to Microbial Indicator Organisms, Dwr Cymru will be undertaking a full shellfish water quality coastal investigation study, building on the work undertaken in the Burry Inlet (Bakar-Abu et al., 2017) in their next AMP PR19 spending round. Implementation of the Bathing Waters Directive is identifying sources of diffuse pollution in the catchment. Diffuse Water Pollution Thematic Action Plan (TAP) (see below) CF07 Reduce/eliminate marine pollution from industrial, commercial, residential and recreational areas and activities Implementation and enforcement of water quality regulation (both marine and freshwater) is ongoing work and is making gains in improving water quality. Management of the wider countryside including the implementation of the River Basin Management Plans by NRW and EA (cross border catchments) is also contributing to improvements (NRW, 2015). Shared multi-agency pollution response plans to deal with major incidences are in place and are regularly updated. Diffuse Water Pollution TAP (see below) Marine Litter TAP (see below) CF10 Manage changes in hydrological and coastal systems and regimes for construction and development Compensation for the loss of intertidal habitats as a result of coastal squeeze caused by flood and coastal erosion schemes is delivered through the National Habitat Creation Project (NHCP). This is in response to the Welsh Government's statutory obligation for compensatory

measures under Article 6(4) of the Habitats Directive, relating to offsetting the impacts of coastal squeeze on Natura 2000 sites. Within the NRW Actions database 185 actions were listed relating to coastal squeeze, 49 of these were under control and 61 complete. The Pen Llyn a'r Sarnau SAC has an objective to restore the 'Estuaries' feature (which will also encompass the sub-features), where the structure and functions of the estuaries that have been damaged/degraded by the constraints of artificial structures such as flood banks. A reduction in the artificial constraints (such as flood banks) on the tidal limits within the estuaries would provide the potential to increase and re-establish estuary communities that have been reduced or lost to past interventions in the estuaries and the full range of zones which this feature encompasses. However, there are many barriers to achieving restoration on such a scale. The Shoreline Management Plans (SMP) (Atkins 2010, Halcrow 2012a, Halcrow 2012b, Royal Haskoning 2012), which identify the most sustainable approach to managing the flood and coastal erosion risks to the coastline in the short medium and long term have been produced for the whole of the Welsh coast, however, these plans have yet to be fully implemented. (see section 9.1b). CN02 Implement climate change adaptation measures The National Habitat Creation Program has been put in place by the Welsh Government to identify and progress opportunities for managed retreat of the coastal line, in order to mitigate losses of intertidal habitats as a result of man-made constraints where Hold The Line policies of the Shoreline Management Plan have been maintained. Flood and Coastal Erosion Risk Management TAP (see below) CA05 Adapt mowing, grazing and other equivalent agricultural activities Just 5% of the 'Salt meadow' feature that is within the Protected Sites, is within a positive management agreement with NRW (NRW GIS agreements layer, accessed March 2018), a further 23% of the feature is covered by the Glastir agri-environment scheme. CG01 Management of professional/commercial fishing (including shellfish and seaweed harvesting) Management of shellfisheries is, to an increasing degree, taking account of the protected nature of estuaries in SACs. The Welsh Government's draft Welsh National Marine Plan identifies potential opportunities for development of shellfisheries across Wales. This is accompanied by appropriate safeguards within Protected Sites, to protect the features, and the draft plan also contains a series of environmental policies that apply throughout Welsh seas that should ensure that all development is sustainable. Where Regulating and Several Orders are applied for, this also provides some safeguards to protect Annex I habitats outside of SACs, although these orders are not compulsory, leaving features under these circumstances under potential threat. Voluntary management measures were implemented at the Gann Flats to manage the intensity of bait digging, but these were not successful. As a result, a byelaw is being developed in an attempt to reduce the impact of bait digging at this location. Minimum size for shellfish collecting: - Byelaws of the former north Western and north Wales sea fisheries committee and south Wales SFC; Welsh Government Statutory Instrument. Introduction of The Scallop Fishing (Wales) (No.2) Order 2010 that prohibits scallop dredging in Welsh SACs (except parts of Cardigan Bay) and near shore waters (1 nm or 3 nm). Marine Fisheries TAP (see below) CF08 Reduce/eliminate marine contamination with litter Some steps have been made towards controlling the use of single use plastics. The Single Use Carrier Bags Charge (Wales) Regulations 2010 (<http://www.legislation.gov.uk/wsi/2010/2880/contents/made>) came into force on the 1 October 2011 and brought into effect a charge of 5p for all single use plastic bags. Environmental Protection (Microbeads) (Wales) Regulations 2018 was voted on and passed by the Welsh Assembly in June 2018 (<http://www.assembly.wales/laid-documents/sub-ld11558-em/sub-ld11558-em-e.pdf>) - the actual legislation is not yet published, but the Explanatory Memorandum was prepared by the Department for Economy, Skills and Natural Resources and laid before the National Assembly for Wales on the 18th May 2018. Future legislation: the EU is looking to create a Directive on single use plastics: [http://ec.europa.eu/environment/circular-economy/pdf/single-use\\_plastics\\_proposal.pdf](http://ec.europa.eu/environment/circular-economy/pdf/single-use_plastics_proposal.pdf). The European Commission (EC) has proposed a full ban on

some of the most commonly used and littered disposable plastic products in Europe. The draft \Single-Use Plastics Directive\, announced in May 2018, proposes measures covering a range of items which constitute the most common sources of marine litter in Europe, including 10 single-use plastic products. CI03 Management, control or eradication of other invasive alien species A current program of work in Wales is identifying pathways that non-native species use to spread. This will reduce the means by which invasive non-native species can spread. Initiatives on pathways and controlling non-native species will also help control pests and pathogens. Evidence from the NRW Actions Database, the Priority Improvement Plans (PIPs) and Site Management Reports has been used. There are few active measures that can be applied, but there are a considerable number of investigations proposed, to improve understanding of the pressures and threats on a site. The Natura 2000 LIFE project also brought together Thematic Action Plans to resolve some of the pressures and threats as follows: - Thematic Action Plan for Flood and Coastal Erosion Risk Management - Thematic Action Plan for Diffuse Water Pollution - Thematic Action Plan for Invasive Species and Pathogens - Thematic Action Plan: Marine Litter - Thematic Action Plan: Marine Fisheries Thematic Action Plan: Flood and Coastal Erosion Risk Management - Implementation of appropriate coastal management - >(pounds) 44 million across the N2K. Mitigation for the coastal squeeze losses delivered through the National Habitat Creation Project (NHCP). This is in response to the Welsh Government's statutory obligation for compensatory measures under Article 6(4) of the Habitats Directive, relating to offsetting the impacts of coastal squeeze on Natura 2000 sites. Thematic Action Plan: Diffuse Water Pollution - Investigation, Direct Management and Management Agreements (incl Glastir) are the main mechanisms to manage diffuse water pollution: Raise the profile of breaches in cross-compliance affecting N2K habitats and features (terrestrial, freshwater and marine) and target compliance monitoring. Risk assessments to be carried out on catchments of N2K sites which have high priority diffuse pollution issues/risks and which are failing under the WFD. Measures put in place throughout the river catchment, through the WFD reduce and control levels of pollutant, including nutrient levels. Examples of new or improved mechanisms may include: - Small-scale standalone capital grant scheme to address diffuse pollution issues. - Development of nutrient management initiatives. - Training for farmers/landowners regarding reducing diffuse pollution, waste management and farm nutrient budgeting. - Catchment Level Rural Sustainable Drainage Systems pilot projects. Thematic Action Plan: Invasive Species and Pathogens - Improve awareness of, and compliance with, good biosecurity practices and training amongst NRW staff and contractors e.g. cleaning of boots/tools/vehicles at entry points to N2K sites. Ensure all NRW staff use bilingual biosecurity e-learning resource. Gather evidence on the presence and distribution of invasive non-natives species within sites, and the activities associated with the vectors of spread. There would also be a need to investigate pathways to and from each site, including from high risk areas adjacent to the site. Ongoing INNS pathway management in Wales will help to deliver the above. Thematic Action Plan: Marine Litter - Direct management is the most frequently identified mechanism for addressing marine litter impacts. This mechanism predominantly refers to action required by Local Authorities (LA) to support and help implement measures to remove litter from beaches (e.g. third-party collections and LA beach cleaning), ensuring that approaches are sensitive to features. - Investigation actions principally relate to improving the evidence base to underpin better management and reduce both sources of marine litter and impacts on features. This includes investigations to develop better understanding of local sources of marine litter and its disposal, and identification of high-risk areas for marine litter. - Targeted education, awareness raising and liaison actions include, for example, developing opportunities to reduce litter at source (locally), including site level awareness Thematic Action Plan: Marine Fisheries - - Investigation is the most frequently identified mechanism against marine fisheries issues / risks. This mechanism is identified for use where a better

understanding and evidence base of the direct and indirect effects on habitats and species is required, to enable the development of management actions where appropriate. - Direct management is cited as a mechanism to address marine fisheries issues/risks, indicating where action is required by the competent authority, the Welsh Government or NRW. This mechanism has been used to highlight the need for further development of cockle fisheries management for Carmarthen Bay and Estuaries SAC. The overarching objective of this action is to integrate environmental assessment and subsequent management for the cockle fishery, taking account of the direct and indirect effects of the removal of cockles on SPA features. Cockle fishery is regulated in the Dee estuary, Malltraeth, Traeth Melynog, Red Wharf Bay, 3 Rivers and Burry Inlet. Intertidal shellfish aquaculture must pass a Habitat Regulations Assessment within existing N2K sites. - Targeted education, awareness raising and liaison as a mechanism can be used to develop projects to educate or inform people about the impacts that activities can have on features and to encourage more sustainable behaviours. A single action was recorded under this mechanism for Anglesey Saltmarsh SAC to address impacts from access for sea fisheries (e.g. cockling, winkle picking, mussels collection) on the mudflats and their typical species (e.g. *Zostera*), and vehicle access across the sediment flats.

9.1 Future prospects of parameters

9.1a Future prospects of -range. Boundaries for Estuaries are based on physiographic features and are therefore unlikely to change, unless there is substantial shift in geomorphology. Some of the losses in MFSF are within Estuaries, but the overall area of the Estuary remains the same. Stable indicated in 2013 (although minor losses indicated due to coastal defence). 9.1b Future prospects of -area Boundaries for Estuaries are based on physiographic features and are therefore unlikely to change, unless there is substantial shift in geomorphology. Some of the losses in MFSF are within Estuaries, but the overall area of the Estuary remains the same. Stable indicated in 2013 (although minor losses indicated due to coastal defence).

11.1 Surface area of the habitat type inside the pSCIs, SCIs and SACs network

2013 value = 549.59 km<sup>2</sup>

11.4 Short term trend of habitat area in good condition within the network; Direction

Current value (N2k and Good) = 11 Km<sup>2</sup> 2013 value (N2k and Good) = 11 Km<sup>2</sup>