Report under The Conservation of Habitats and Species Regulations 2017 (as amended), Regulation 9A

2019-2024

Conservation status assessment for the habitat:

H1130 - Estuaries

Wales

For further information please contact:

Natural Resources Wales, Welsh Government Offices, Cathays Park, King Edward VII Avenue, Cardiff, CF10 3NQ. https://naturalresources.wales

JNCC, Quay House, 2 East Station Road, Fletton Quays, Peterborough, PE2 8YY. https://jncc.gov.uk

This report was produced by JNCC in collaboration with Natural Resources Wales.

This document should be cited as:

Natural Resources Wales and JNCC. (2026). Conservation status assessment for the habitat: H1130 Estuaries.

Important note - Please read

- The information in this document represents Wales Report under The Conservation of Habitats and Species Regulations 2017 (as amended), Regulation 9A, for the period 2019-2024.
- It is based on supporting information provided by Natural Resources Wales, which is documented separately.
- The Habitats Regulations reporting 2019-2024 Approach Document provides details on how this supporting information contributed to the UK Report and the fields that were completed for each parameter.
- Maps showing the distribution and range of the habitat are included.
- Explanatory notes (where provided) are included at the end. These provide additional audit trail information to that included within the assessments. Further underpinning explanatory notes are available in the related country reports.
- 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 not relevant to this habitat (section 11 National Site Network coverage for Annex I habitats).

Further details on the approach to the Habitats Regulations Reporting 2019-2024 are available on the JNCC website.

Assessment Summary: Estuaries

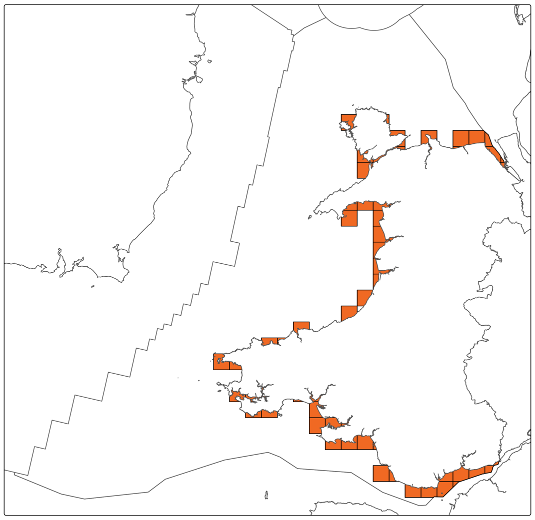
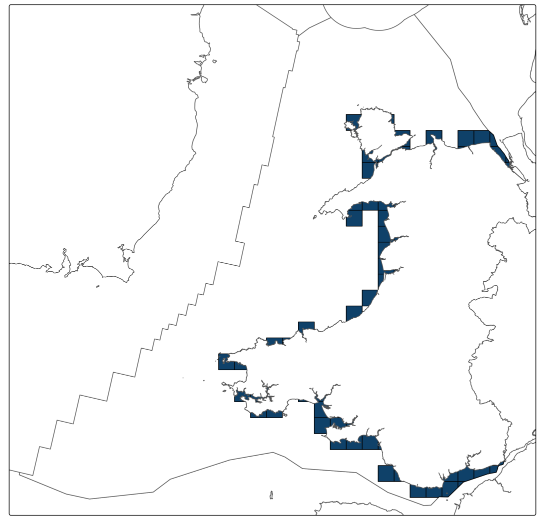
Distribution Map	Range Map
	

Figure 1: Wales distribution and range map for H1130 - Estuaries. Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority. 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.

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 mapped range was considered equivalent to the surface area (distribution) of the habitat.

Table 1: Table summarising the conservation status for H1130 - Estuaries. Overall conservation status for habitat is based on assessments of range, area covered by habitat, structure and functions, and future prospects.

Overall Conservation Status (see section 10)

Unfavourable-inadequate (U1)

Breakdown of Overall Conservation Status

Range (see section 4)	**Favourable (FV)**
Area covered by habitat (see section 5)	**Favourable (FV)**
Structure and functions (see section 6)	**Unfavourable-inadequate (U1)**
Future prospects (see section 9)	**Unfavourable-inadequate (U1)**

List of Sections

National Level

1. General information

1.1 Country	Wales
1.2 Habitat code	H1130 - Estuaries

2. Maps

2.1 Year or period	2013-2024
2.2 Distribution map	Yes
2.3 Distribution map; Method used	Based mainly on extrapolation from a limited amount of data

2.4 Additional information

No additional information

Biogeographical Level

3. Biogeographical and marine regions

3.1 Biogeographical or marine region where the habitat occurs	MATL

3.2 Sources of information

See section 13 References

4. Range

4.1 Surface area (km²)	590.44

4.2 Short-term trend; Period	2019-2024
4.3 Short-term trend; Direction	Stable
4.4 Short-term trend; Magnitude	
a) Estimated minimum	

b) Estimated maximum	
c) Pre-defined range	
d) Unknown	
e) Type of estimate	
f) Rate of decrease	
4.5 Short-term trend; Method used	Based mainly on extrapolation from a limited amount of data

4.6 Long-term trend; Period	1995-2024
4.7 Long-term trend; Direction	Stable
4.8 Long-term trend; Magnitude	
a) Minimum	
b) Maximum	
c) Rate of decrease	
4.9 Long-term trend; Method used	Based mainly on extrapolation from a limited amount of data

4.10 Favourable Reference Range (FRR)

a) Area (km²)	
b) Pre-defined increment	Current range is less than 2% smaller than the FRR
c) Unknown	No
d) Method used	Reference-based approach
e) Quality of information	moderate

4.11 Change and reason for change in surface area of range

a) Change	Yes
b) Genuine change	No
c) Improved knowledge or more accurate data	No

d) Different method	Yes
e) No information	No
f) Other reason	No
g) Main reason	Use of different method

4.12 Additional information

No additional information

5. Area covered by habitat

5.1 Year or period	2013-2024
5.2 Surface area (km²)	
a) Minimum	
b) Maximum	
c) Best single value	601.907
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	2007-2024
5.6 Short-term trend; Direction	Stable
5.7 Short-term trend; Magnitude	
a) Estimated minimum	
b) Estimated maximum	
c) Pre-defined range	
d) Unknown	
e) Type of estimate	
f) Rate of decrease	
5.8 Short-term trend; Method used	Based mainly on extrapolation from a limited amount of data

5.9 Long-term trend; Period	1995-2024

5.10 Long-term trend; Direction	Decreasing
5.11 Long-term trend; Magnitude	
a) Minimum	
b) Maximum	
c) Confidence interval	
d) Rate of decrease	Decreasing <=1% (one percent or less) per year on average
5.12 Long-term trend; Method used	Based mainly on extrapolation from a limited amount of data

5.13 Favourable Reference Area (FRA)	
a) Area (km²)	
b) Pre-defined increment	Current area is less than 2% smaller than the FRA
c) Unknown	No
d) Method used	Reference-based approach
e) Quality of information	moderate

5.14 Change and reason for change in surface area of range

a) Change	Yes
b) Genuine change	Yes
c) Improved knowledge or more accurate data	Yes
d) Different method	No
e) No information	No
f) Other reason	No
g) Main reason	Improved knowledge/more accurate data

5.15 Additional information

No additional information

6. Structure and functions

6.1 Condition of habitat (km²)

Area in good condition	
ai) Minimum	70.616
aii) Maximum	70.616
Area not in good condition	
bi) Minimum	531.213
bii) Maximum	531.213
Area where condition is unknown	
ci) Minimum	0.078
cii) Maximum	0.078
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	2018-2024
6.4 Short-term trend of habitat area in good condition; Direction	Stable
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

Typical species were not used directly in the assessment of conservation status for habitat structure and function as a comprehensive list of typical species for each habitat was not available. However, the status of typical species was considered when the condition of individual sites was assessed using Common Standards Monitoring Guidance. Common Standards Monitoring (CSM) data was used to assess the area of habitat in 'good' and 'not good' condition (field 6.1). Species were a component of the attributes assessed under CSM. Therefore, an assessment of species is considered to have formed part of the reporting under field 6.1 which supported the Habitats Structure and Function assessment (field 10.3).

7. Main pressures

7.1 Characterisation of pressures

Table 2: Pressures affecting the habitat, including timing and importance/impact ranking. Pressures are defined as factors acting currently and/or during the reporting period (2019–2024). Rankings are: High (direct/immediate influence and/or large spatial extent) and Medium (moderate direct/immediate influence, mainly indirect and/or regional extent).

Pressure	Timing	Ranking
PA07: Intensive grazing or overgrazing by livestock	Ongoing and likely to be in the future	High (H)
PA17: Agricultural activities generating pollution to surface or ground waters (including marine)	Ongoing and likely to be in the future	High (H)
PF15: Modification of coastline, estuary and coastal conditions for built-up areas	Ongoing and likely to be in the future	High (H)
PK02: Mixed source marine water pollution (marine and coastal)	Ongoing and likely to be in the future	High (H)
PA01: Conversion into agricultural land (excluding drainage and burning)	Ongoing and likely to be in the future	Medium (M)
PD05: Development and operation of energy production plants (including infrastructure)	Ongoing and likely to be in the future	Medium (M)
PE02: Shipping lanes and ferry lanes transport operations	Ongoing and likely to be in the future	Medium (M)
PE03: Shipping lanes, ferry lanes and anchorage infrastructure (e.g. canalisation, dredging)	Ongoing and likely to be in the future	Medium (M)
PE07: Land, water and air transport activities generating marine pollution	Ongoing and likely to be in the future	Medium (M)
PF06: Deposition and treatment of waste/ rubbish from built-up areas	Ongoing and likely to be in the future	Medium (M)

PF10: Residential, commercial and industrial activities and structures generating marine pollution	Ongoing and likely to be in the future	Medium (M)
PG01: Marine fish and shellfish harvesting causing reduction of species/prey populations and disturbance of species (professional)	Ongoing and likely to be in the future	Medium (M)
PH08: Other human intrusions and disturbance not mentioned above	Ongoing and likely to be in the future	Medium (M)
PI01: Invasive alien species of Union concern	Ongoing and likely to be in the future	Medium (M)
PI02: Other invasive alien species (other than species of Union concern)	Ongoing and likely to be in the future	Medium (M)
PL05: Modification of hydrological flow (mixed or unknown drivers)	Ongoing and likely to be in the future	Medium (M)
PD01: Wind, wave and tidal power (including infrastructure)	Only in future	Medium (M)
PJ01: Temperature changes and extremes due to climate change	Only in future	Medium (M)
PJ03: Changes in precipitation regimes due to climate change	Only in future	Medium (M)
PJ04: Sea-level rise due to climate change	Only in future	Medium (M)

7.2 Sources of information

See section 13 References

7.3 Additional information

No 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, surface area or structure and functions of the habitat type
8.3 Location of the measures taken	Both inside and outside National Site Network
8.4 Response to measures	Medium-term results (within the next two reporting periods, 2025–2036)

8.5 List of main conservation measures

Table 3: Key conservation measures addressing current pressures and/or anticipated threats during the next two reporting periods (2025–2036). Measures are ranked by importance/impact: High (direct/ immediate influence and/or large spatial extent) and Medium (moderate direct/immediate influence, mainly indirect and/or regional extent).

Conservation measure	Ranking
MA10: Reduce/eliminate point or diffuse source pollution to surface or ground waters (including marine) from agricultural activities	High (H)
MF02: Habitat restoration of areas impacted by residential, commercial, industrial and recreational infrastructure, operations and activities	High (H)
MF06: Reduce/eliminate marine pollution from industrial, commercial, residential and recreational areas and activities (incl. contamination with litter)	High (H)
MF08: Manage changes in hydrological and coastal systems and regimes for construction and development (incl. restoration of habitats).	High (H)
MK01: Reduce impact of mixed source pollution	High (H)
MA05: Adapt mowing, grazing and other equivalent agricultural activities (e.g. burning)	Medium (M)
MG01: Management of professional/commercial fishing, shellfish and seaweed harvesting (incl. restoration of habitats)	Medium (M)
MI03: Management, control or eradication of other invasive alien species	Medium (M)
MJ02: Implement climate change adaptation measures	Medium (M)

8.6 Additional information

No additional information

9. Future prospects

9.1a Future trends of parameters

ai) Range	Overall stable
bi) Area	Negative - decreasing <=1% (one percent or less) per year on average
ci) Structure and functions	Unknown

9.1b Future prospects of parameters

aii) Range	Good
bii) Area	Poor
cii) Structure and functions	Unknown

9.2 Additional information

No additional information

10. Conclusions

10.1 Range	Favourable (FV)
10.2 Area	Favourable (FV)
10.3 Specific structure and functions (incl. typical species)	Unfavourable-inadequate (U1)
10.4 Future prospects	Unfavourable-inadequate (U1)
10.5 Overall assessment of Conservation Status	Unfavourable-inadequate (U1)
10.6 Overall trend in Conservation Status	Stable

10.7 Change and reason for change in conservation status

This field is not reported as the period 2019-2024 marks the first instance in which conservation status has been assessed at the national level, meaning no comparisons to previous reports can be drawn.

10.7 Change and reason for change in conservation status trend

This field is not reported as the period 2019-2024 marks the first instance in which conservation status has been assessed at the national level, meaning no comparisons to previous reports can be drawn.

10.8 Additional information

No additional information

11. UK National Site Network (pSCIs, SCIs, SACs) coverage for Annex I habitat types

11.1 Surface area of the habitat type inside the pSCIs, SCIs and SACs network (km²)

a) Minimum	
b) Maximum	
c) Best single value	555.249
11.2 Type of estimate	Best estimate
11.3 Habitat area inside the network; Method used	Based mainly on extrapolation from a limited amount of data
11.4 Short-term trend of habitat area within the network; Direction	Stable
11.5 Short-term trend of habitat area within the network; Method used	Based mainly on extrapolation from a limited amount of data
11.6 Short-term trend of habitat area in good condition within the network; Direction	Stable
11.7 Short-term trend of habitat area in good condition within the network; Method used	Based mainly on extrapolation from a limited amount of data

11.8 Additional information

No additional information

12. Complementary information

12.1 Justification of percentage thresholds for trends

No justification information

12.2 Other relevant information

No other relevant information

13. References

Biogeographical and marine regions

3.2 Sources of information

Abu-Bakar A, Ahmadian R, Falconer RA. 2017. Modelling the transport and decay processes of microbial tracers in a macro-tidal estuary. Water Research 123: 802-824

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

Atkins. 2010. SMP 19, Anchor Head to Lavernock Point (Severn Estuary) Shoreline Management Plan (SMP) Review.

Bergmann M, Gutow L, Klages M. 2015. Marine Anthropogenic Litter. https://link.springer.com/content/pdf/10.1007%2F978-3-319-16510-3.pdf

Bohn K. 2014. The distribution and potential northwards spread of the invasive slipper limpet Crepidula fornicata in Wales, UK. NRW Evidence Report No: 40, 43pp, Natural Resources Wales, Bangor.

Boorman LA, Hazelden J. 2012. Impacts of additional aerial inputs of nitrogen to saltmarsh and transitional habitats. CCW Science Report No: 995, Countryside Council for Wales, Bangor, Wales.

Brazier DP. 2013. Evaluating intertidal Zostera noltii beds - field survey vs remote sensing. CCW Marine Monitoring Report No. 103. CCW, Bangor

Brazier DP. in prep. Pembroke power Station - limpet size profiles. NRW data.

Brazier, D. P. in prep. Across-Wales intertidal SAC monitoring, Pen Llŷn a'r Sarnau SAC intertidal reef monitoring 2012 - 2022. NRW Evidence Report No: 786, vii + 22, NRW, Bangor

Bricheno, L.M., Woolf, D., Valiente, N.G., Makrygianni, N., Chowdhury, P., and Timmermans, B. 2025. Climate change impacts on storms and waves relevant to the UK and Ireland. MCCIP Science Review 2025, 24pp.

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.

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.

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

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.

Bunker, F. St. P. D., Díaz-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

Department for Transport. 2024. Domestic air pollution emissions from transport in 2022 Available from: https://www.gov.uk/government/statistics/transport-and-environment-statistics-2024/domestic-air-pollution-emissions-from-transport-in-2022s from transport in 2022 - GOV.UK.

Dewey, N., Pack, K, Williamson, D, Walsh, A. 2020. Welsh Marine Invasive Non-Native Pathways Assessment NRW Evidence Report No: 459, 90pp, Natural Resources Wales, Bangor.

Duggan-Edwards M, Brazier DP. 2015. Intertidal SAC monitoring Zostera noltii in Angle Bay, Pembrokeshire Marine SAC 2013. NRW Evidence Report No: 55, 38pp + 'xi, 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

European Commission (2000) The EU Water Framework Directive 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

European Commission (2014) The Common Fisheries Policy (CFP) 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, H.M. 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.

Gihwala, K.N., Frost, N.J., Upson, M.A. 2024. Climate change impacts on Welsh MPAs: Risks to Annex I features and associated blue carbon habitats. Report No: 775. 175pp. Natural Resources Wales, 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: https://environment.data.gov.uk/shoreline-planning/shoreline-management-plan/SMP22

downloads

Halcrow Group. 2012b. SMP 20 Lavernock Point to St Ann's Head (South Wales) Shoreline Management Plan SMP2. Available from: https://www.southwalescoastalgroup.cymru/the-shoreline-management-plan-2/da7bba7b-e8c1-44a5-ab97-c92db850a0da

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 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

Hoppit, G., Schmidt, D., 2022. A Regional View of the Response to Climate Change: A Meta-Analysis of European Benthic Organisms' Responses. Frontiers in Marine Science. 9:896157.

ICES advice (C. harengus) (2017) Herring (Clupea harengus) in division 7.a (Irish Sea)

ICES advice (C. harengus) (2017) Herring (Clupea harengus) in division 7.a South of 52°30′N, 7.g–h, and 7.j–k (Irish Sea, Celtic Sea, and southwest of Ireland) - http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2018/2018/her.27.irls.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%20Reports/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%20Reports/Advice/2017/2017/whg.27.7a.pdf

ICES. (2023c) Whiting (Merlangius merlangus) in Division 7.a (Irish Sea). In Report of the ICES Advisory Committee, 2023. ICES Advice 2023, whg.27.7a. https://doi.org/10.17895/ices.advice.21864330

ICES. (2024b) Plaice (Pleuronectes platessa) in Division 7.a (Irish Sea). In Report of the ICES Advisory Committee, 2024. ICES Advice 2024, ple.27.7a. https://doi.org/10.17895/ices.advice.25019447

ICES. (2024c) Plaice (Pleuronectes platessa) in divisions 7.f and 7.g (Bristol Channel, Celtic Sea). In Report of the ICES Advisory Committee, 2024. ICES Advice 2024, ple.27.7fg, https://doi.org/10.17895/ices.advice.25019456

ICES. (2024e) Sole (Solea solea) in Division 7.a (Irish Sea). In Report of the ICES Advisory Committee, 2024. ICES Advice 2024, sol.27.7a. https://doi.org/10.17895/ices.advice.25019672

ICES. (2024f) Sole (Solea solea) in divisions 7.f and 7.g (Bristol Channel, Celtic Sea). In Report of the ICES Advisory Committee, 2024. ICES Advice 2024, sol.27.7fg. https:/doi.org/10.17895/ices.advice.25019681

IMO. 2014. International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships%27-Ballast-Water-and-Sediments-(BWM).aspx

Jackson-Bué, M., Wynter, E., Brazier, D.P., Cuthbertson, S. and Hatton-Ellis, M. 2025. Condition Assessments for Mudflats and Sandflats not Covered by Seawater at Low Tide in Welsh Special Areas of Conservation. NRW Evidence Report No. XXX, 116 pp, Natural Resources Wales, Cardiff.

Jackson-Bué, M., Wynter, E., Cuthbertson, S. and Hatton-Ellis, M. 2025. Condition Assessments for Estuaries in Welsh Special Areas of Conservation. NRW Evidence Report No. 895, 112 pp, Natural Resources Wales, Cardiff.

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,

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 Llŷn a'r Sarnau SAC Monitoring Report 2011: H1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae), 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

Lynam, C., Allison, C., Ribeiro, J., Campon-Linares, V., Garnacho E. (2022) International (ICES) and national UK fish stocks and shellfish data from 2020 assessment year. https://doi.org/10.14466/CefasDataHub.120

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).

Marine Conservation Society, 2024. State of our beaches report.

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.

Mercer, T. & Brazier D.P. 2023 Intertidal SAC monitoring of the non-native alga Agarophyton vermiculophyllum 2017 - 2022. NRW Evidence Report No: 666, vi+16pp, Natural Resources Wales, Bangor.

Mercer, T. S. 2022. Across-Wales intertidal SAC monitoring, Pen Llŷn a'r Sarnau SAC 2015 - 2019. NRW Evidence Report No: 582, xv + 89, Aquatic Survey & Monitoring Ltd. Harehope Quarry, Co. Durham.

Mercer, T. S. 2022. Across-Wales intertidal SAC monitoring, Pen Llyn a'r Sarnau SAC 2015-2019. NRW Evidence Report No 582, pp xiii + 90, Aquatic Survey & Monitoring Ltd. Harehope Quarry, Co. Durham.

Mieszkowska, N. & Sugden, H. 2022. MarClim Annual Welsh Intertidal Climate Monitoring Survey 2021. Natural Resources Wales Evidence Report No. 601 pp 24 + xi, Natural Resources Wales, Bangor.

Mieszkowska, N. & Sugden, H. 2025. MarClim Annual Welsh Intertidal Climate Monitoring Survey 2023. Natural Resources Wales Evidence Report No. 776, pp ix + 24, Natural Resources Wales, Bangor

Mieszkowska, N. 2021. MarClim Annual Welsh Intertidal Climate Monitoring Survey 2020. Natural Resources Wales Evidence Report No. 563, pp x + 21, Natural Resources Wales, Bangor.

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, Bunker, F.D, Mercer, T., Howson, C.H. & Brazier, D.P. 2021. Wales intertidal SAC feature assessment summary 2016. NRW Evidence Report No 063, Xiv + 43pp, Natural Resources Wales.

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.

Moore, P., Smale, D., 2020. Impacts of climate change on shallow and shelf subtidal habitats relevant to the coastal and marine environment around the UK. MCCIP Science Review 2020, 272–292

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 Môn: 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 Llŷn a'r Sarnau / Lleyn 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 / Môr 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.

NRW. 2025a. 2019-2024 Evidence pack for Annex B & D feature reports H1330 Salt Meadows Habs Regs 9A Evidence Pack

NRW. 2025b. 2019-2024 Evidence pack for Annex B & D feature reports H1310 Salicornia Habs Regs 9A Evidence Pack

NRW. 2025c. 2019-2024 Evidence pack for Annex B & D feature reports S1095 sea lamprey Habs Regs 9A Evidence Pack

NRW. 2025d. 2019-2024 Evidence pack for Annex B & D feature reports S1099 river lamprey Habs Regs 9A Evidence Pack

NRW. 2025e. 2019-2024 Evidence pack for Annex B & D feature reports S1103 Twaite shad Habs Regs 9A Evidence Pack

NRW. 2025f. 2019-2024 Evidence pack for Annex B & D feature reports S1102 Allis shad Habs Regs 9A Evidence Pack

NRW. 2025g. 2019-2024 Evidence pack for Annex B & D feature reports S1355 otter Habs Regs 9A Evidence Pack

Oaten J, Finch D, Frost N 2024. Understanding the likely scale of deterioration of Marine Protected Area features due to coastal squeeze: Volume 2 – Results & Discussion. NRW Evidence Report No: 789, 112pp, Natural Resources Wales, Bangor.

OSPAR, 2023: The 2023 Quality Status Report for the Northeast Atlantic. OSPAR Commission, London. Available at: https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/indicator-assessments/phys-dist-habs-fisheries/ Hoppit, G., Schmidt, D., 2022. A Regional View of the Response to Climate Change: A Meta-Analysis of European Benthic Organisms' Responses. Frontiers in Marine Science. 9:896157.

Pauls L. 2017. Carmarthen Bay and Estuaries SAC Atlantic Salt Meadows SAC Monitoring Report. NRW Evidence Report 222.

Pears, S. & Green, M. draft. Three Rivers inlets infauna, sediment particle size and chemistry monitoring report. NRW Evidence Report No xx. Pp xx + xx.

Pears, S. & Green, M. in prep. Milford Haven inlets infauna, sediment particle size and chemistry monitoring report. NRW Evidence Report No xx. Pp xx + xx. APEM.

Perrins, J., Lush, M., Taylor, T., Holt, R and Bunker, F. 2020. Investigating the location and intensity of bait digging in Wales. NRW Evidence Report Series Report No: 449, 170pp, NRW, Bangor.

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 1998. CCW Contract Science Report No. 376.

Robinson, K. 2024. 2024 Habitat Regulations 9a Assessment: Estuaries mapping work. NRW unpublished internal document.

Royal Haskoning. 2012. SMP 21 St Ann's Head to Great Ormes Head (West of Wales) Shoreline Management Plan 2. Available from: https://www.grwparfordirolgorllewincymru.cymru/page/smp2/smp2.

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

Sherry J, Douglas E. 2025. Strategic review of grazing on saltmarsh features in Welsh Marine Protected Areas (MPAs) and development of actions to improve condition. NRW Environmental Evidence Report No: 664, 113pp, NRW, Cardiff

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

Tillin, H.M., Kessel, C., Sewell, J., Wood, C.A., Bishop, J.D.D. 2020. Assessing the impact of key Marine Invasive Non-Native Species on Welsh MPA habitat features, fisheries and aquaculture. NRW Evidence Report. Report No: 454, 260pp, Natural Resources Wales, Bangor.

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%20documents/sub-ld11558-em/sub-ld11558-em-e.pdf

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)

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

West, V.A., Frost, N.J., and Hull, S.C. 2020. Impacts of Bait Digging on the Gann: Analysis of Monitoring Data. NRW Evidence Report No: 450, 85pp, NRW, Bangor.

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.

Wood, C.A., Tidbury, H., and Bishop, J.D.D, 2024. Comprehensive marine Non-Native Species (NNS) survey for England and Wales. NECRXXX. Natural England.

Woolf D. & Wolf J. 2013. Impacts of climate change on storms and waves. MCCIP Science Review 2013: 20-26. http://www.mccip.org.uk/media/1249/2013arc_sciencereview_03_st_wav_final.pdf

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.

Main pressures

7.2 Sources of information

No sources of information

14. Explanatory Notes

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. Most estuarine habitats are included in the mapped layer (some small estuaries are possibly overlooked, e.g. Cemaes, Amlwch). As a physiographic feature, the boundary is not precisely aligned with the features or sub-features of the estuary. See Robinson (2024) – 'HabsRegs9aGIS processing notes Estuaries_2024' for full details.
4.2: Short-term trend; Period	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 Robinson (2024).
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).
4.5: Short-term trend; Method used	Boundaries for Estuaries are based on physiographic features and are therefore unlikely to change, unless there is substantial shift in geomorphology. See Robinson (2024) - 'HabsRegs9a GIS processing notes Estuaries_2024' for full details.
4.6: Long-term trend; Period	Boundaries for Estuaries are based on physiographic features and are therefore unlikely to change, unless there is substantial shift in geomorphology.
4.7: Long-term trend; Direction	There have been some significant recorded estuary habitat losses in the past (e.g. Cardiff Bay barrage, river Neath). Doesn't affect the range
4.8: Long-term trend; Magnitude	Insufficient available data to generate magnitude values.
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 Robinson (2024).
5.2: Surface area	(2018 NRW value = 595.31 km2) (2018 JNCC value - 590.44 km2) (2013 Area = 591.91 km2) The total area of Estuary in Wales is calculated as being in excess of 600 km2, the figure varying from previous assessments due to addition of more estuaries to the assessment.
5.4: Surface area; Method used	See Robinson (2024) - 'HabsRegs9a GIS processing notes Estuaries_2024' 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. The losses identified, where seabed has been removed from the tidal prism adds up to 0.2 Km2. Some additional estuaries have been added to the dataset, so that the total area covered has increased, based on expansion of the definition of Estuaries and mapping changes.
5.7: Short-term trend; Magnitude	Additional mapped Estuaries have caused an increase in the area value
5.8: Short-term trend; Method used	See Robinson (2024) - 'HabsRegs9a GIS processing notes Estuaries_2024' 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).
5.12: Long-term trend; Method used	See Robinson (2024) - 'HabsRegs9a GIS processing notes Estuaries_2024' for full details.
5.14: Change and reason for change in surface area	The difference between 2018 and 2024 values is due to additional Estuaries being added to the GIS layer and also possible changes in managing the data using the GIS.
6.1: Condition of habitat	a) Area in good condition – 70.616 Km2 (2013 – 6.89 km2) (2018 - 11.19 km2) b) Area in not-good condition – 531.213 Km2 (2013 – 585.02 km2) (2018 -506.26 km2) c) Area where condition is not known – 0.078 Km2 (2013 – 0.00 km2) (2018 - 72.99 km2 Not known figure adjusted to match that

of JNCC, following JNCC QA)

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 differences in the proportions of Good / not good, compared with previous reporting rounds is largely due to the inclusion of numerous smaller estuaries, which has increased the overall area assessed and also the proportion that is now considered Good

(Good/Not Good/Unknown (Km2) 2013 = 6.89/585.02/0.00, 2018 = 11.19/506.26/77.86).

(2018 - Good = 11.19 km2, Not Good = 506.26 km2).

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 IQI or DIN are unfavourable, since a fail for a determinand (other than water quality contaminants, see below) under WFD is deemed to be of ecological significance.

The recent condition assessments (Jackson-Bué et al. 2025) have the water quality contaminants as a secondary indicator, meaning that they would not fail an area of feature if that was the only failure. In the GIS, it is possible to describe the areas of failure at a higher resolution than has been the case in the Condition Assessments, such that, where a whole SAC may fail in the Condition Assessment, the spatial distribution of the failure can be presented as more specific areas within the SAC. Values are based on the finer level of resolution that is possible using the GIS.

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, Alaw, Ffraw, Braint, Erch, Ystwyth, Teifi, Nyfer, Gwaun, Solfach estuaries, Milford Haven, 3 Rivers system, inner Burry Inlet, Pennard Pill (Gower), Ogmore, Thaw and Wye estuaries have a 'Moderate' DIN classification 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 on 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 2013, 2016a, b). They remain in favourable condition, although there are some losses to coastal developments.

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). The Milford Haven showed increasing organic carbon levels in sediments, high levels of PAHs and heavy metals and declines in live maerl, Zostera marina, herring population and sponge thickness.

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 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, 2023). Recent additions to the INNS in the Milford Haven are Didemnum vexillum, Watersipora subatra and Undaria pinnatifida.

There has been rapid establishment of G. vermiculophylla in the Burry Inlet, which has started to alter the habitat present on the sediment flats.

ICES advice for typical estuary fish species, where available, has been reviewed. 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 Estuaries feature 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 estuary. 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). From the Atlantic saltmarsh reporting, the short term trend in area is likely to be stable with losses in extent of saltmarsh due to sea level rise offset by gains due to expansion within infilling estuaries.

	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, 2025 c-f). Otter are favourable in Wales (NRW, 2025g).
6.4: Short-term trend of habitat area in good condition; Direction	The differences in the proportions of Good / not good, compared with previous reporting rounds is largely due to the inclusion of numerous smaller estuaries, which has increased the overall area assessed and also the proportion that is now considered Good (Good/Not Good/ Unknown (Km2) 2013 = 6.89/585.02/0.00, 2018 = 11.19/506.26/77.86).
6.5: Short-term trend of habitat area in good condition; Method used	Followed methods that are utilised in the condition assessments Increase in recorded 'Good' is largely accounted for by different methods of mapping condition (including uncertainty on the effects of fishery activities) and changes in the way WFD waterbodies failures for chemical determinands are dealt with.
7.1: Characterisation of pressures	The levels of Pressure and Threat listed are based on those recorded in the NRW Actions Database Safle, Marine Protected Area (MPA) Site Condition Assessments, NRW Evidence Reports, Water Environment (previously known as Water Framework Directive Data), Analysis of Nitrogen Deposition data and in some cases expert judgment. The full extent of the effect of an activity has been considered, which typically extends beyond the immediate footprint of the activity. A back check has been completed, against the 2018 reports, to ensure consistency of approach. PA01: Conversion into agricultural land (excluding drainage and burning) Historic land claim has led to considerable losses in

saltmarsh extent, distribution and has altered the structure, function and hydrology of the vast majority of the estuaries and sheltered bays in Wales. These areas, protected by flood banks now have the potential to cause coastal squeeze (See PJ04).

PA05: Abandonment of management/use of grasslands and other agricultural and agroforestry systems (e.g. cessation of grazing, mowing or traditional farming)

Abandonment of grazing on traditionally grazed saltmarsh is increasing (NRW, 2025a). This is often due to livestock welfare issues with grazing in the intertidal with high tides and dangerous muddy creeks. There are often barriers to getting livestock on and off marshes to avoid high tides, include infrastructure such as railway lines and roads which contribute to some areas of saltmarsh being abandoned. Lack of grazing in the upper marsh can lead to uniform stands of vegetation with low diversity (Sherry & Douglas, 2025).

PA07: Intensive grazing or overgrazing by livestock.

In the saltmarshes of the estuaries, many issues relating to over grazing are listed within 3 SACs, in the NRW Actions Database. Overgrazing on saltmarsh is causing poor conditions comprising uniform sward structure, low species diversity, plants being unable to flower and set seed and areas of bare ground due to livestock poaching and erosion of creek sides. The areas of intensive grazing cover a significant proportion of Welsh saltmarshes particularly within the North Gower area of the Carmarthen Bay and Estuaries SAC.

Within the 2013-2018 reporting round just 5% of H1330 within the protected sites was under a positive management agreement with NRW (taken from the NRW GIS agreements layer, accessed March 2018). A further 23% of the feature was covered by the Glastir agri-environment scheme. There are x of saltmarsh land holdings within protected sites also under positive agricultural management agreements. No up to date information has been available.

With the end of the Glastir agri-environment scheme in 2024 there has been an interim scheme set up to bridge the gap until the fazed implementation of the Welsh Government Sustainable Farming Scheme. However take up of the interim scheme for saltmarsh has been below Glastir levels, therefore there is less land under positive management within Agri-Environment schemes, the outcome of this is not yet known however it is likely that there will be some declines in condition.

PA17: Agricultural activities generating pollution to surface or ground waters (including marine)

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).

PB19: Forestry activities generating pollution to surface or ground waters (including marine)

Changes in land use involving clear felling can generate runoff that results in raised sediment input and deposition e.g. Milford Haven. Rapid response to tree disease can result in large scale deforestation on occasions. Particularly a threat for estuarine locations, requiring appropriate measures to ensure control of water and sediment from forestry sites.

PC13: Mining and extraction activities not referred to above

Waste water from mines in mid Wales has resulted in sediments in and adjacent to these catchments having raised heavy metals. Estuary sediments particularly hold a legacy of heavy metals which are a threat to water and surface sediment quality, should it be disturbed in the future (including from river spate and changing river channels).

PD01: Wind, wave and tidal power (including infrastructure)

Threat of a number of renewable energy tidal lagoons in the future. Such developments could have the potential to alter the tidal range both inside and outside the lagoon structure leading to losses in extent and damage to the structure and function of this feature. Within MPAs, these will require a HRA assessment, with appropriate mitigation if necessary. Recent plans for a tidal lagoon in the Severn estuary have currently stalled, such that this is now a threat only. Also some plans for a lagoon that would affect the Dee estuary.

PD05: Development and operation of energy production plants (including infrastructure).

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 widespread thermal impacts from this source. 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).

PD06: Transmission of electricity and communications (cables)

The UK government's commitment to achieving 50 GW of offshore wind generating capacity by 2030 means this growth is going to continue at a rapid pace over the next five years at least. This represents a threat to saltmarsh; cabling through saltmarsh can in some cases lead to permanent loss of extent and poor condition within the cable corridor. However, legislation should ensure that there is mitigation measures and compensation habitat where appropriate (NRW, 2025a).

PE02: Shipping lanes and ferry lanes transport operations

Milford Haven Waterway supports one of the UK's biggest ports, with the Dee, Neath, Taf and Severn estuaries also having port infrastructure in the lower estuary. Investment in port infrastructure generates frequent development plans that have had consequences for the ria. Significant amounts of large vessel manoeuvring and mooring potentially impact estuary habitats through siltation and turbidity effects. Further work is required to identify links between silt levels and the various shipping activities. There is pressure from chronic input of hydrocarbons in port and recreational harbour areas, especially Milford Haven Waterway, though indications are that hydrocarbon contaminant loads there are decreasing (Little, 2009). Bioaccumulation of contaminants indicates some levels high enough to cause adverse effects to biota (Langston et al., 2011). Pressure from occasional spills (e.g. Sea Empress) and continued presence and reworking of historic oil.

TBT levels are reducing but pressure from use of antifoulants on recreational boats and commercial shipping is still present.

PE03: Shipping lanes, ferry lanes and anchorage infrastructure (e.g. canalisation, dredging)

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

- anchoring of small vessels in seagrass beds 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).

dredging of small boat moorings and access at Shell Island causing possible draw down from the saltmarsh.

PE07: Land, water and air transport activities generating marine pollution

Marine pollution derived from port activities, tankers, ferries, as well as on-land transport links. Estuaries receive a considerable cocktail of potentially polluting compounds from upstream rivers and from marine activities. The depositional nature of estuaries results in accumulation of such compounds in the sediments, potentially causing chronic damage to the fauna and flora.

PF03: Creation or development of sports, tourism and leisure infrastructure

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. A greater risk for the future, as coastal populations expand.

PF05 Sports, tourism and leisure activities

The pressures for sport, tourism and leisure activities are generally localised. The use of vehicles on the saltmarsh can be particularly damaging and other issues include access on foot, horse riding and moorings boats on the saltmarsh.

PF06: Deposition and treatment of waste/rubbish from built-up areas

There are 265 landfill sites along the Welsh coast that have the potential to release waste directly into the marine environment based on present day flooding and coastal erosion data (Robbins et al. 2023). H1330 (Atlantic Salt Meadow) was assessed as having high sensitivity to chemical contamination and medium sensitivity abrasion / disturbance of the substrate on the surface of the seabed and smothering and siltation, nutrient enrichment and organic enrichment (Robbins et al. 2023).

Concentrations of coastal landfill sites occur around the Dee Estuary, Burry Inlet and the Severn Estuary in Wales with the Dee Estuary and Burry Inlet in particular, supporting a significant proportion of Atlantic Salt Meadow (Robbins et al. 2023).

PF10: Residential, commercial and industrial activities and structures generating marine pollution

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; Marine Conservation Society, 2024; 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.

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.

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).

Several estuaries, with large catchments, have raised levels of nutrients and contaminants. Contaminant inputs are from diffuse (urban and industrial run off) as well as point source industrial discharges. Below 'Good' WFD water body assessments tend to reflect this.

Sediments adjacent to capped landfill discharge in Milford Haven Waterway have significantly raised contaminant levels (PAH & metals). Contaminant levels are greatest where industry is associated an adjacent catchment e.g. Milford Haven Waterway. Hydrocarbons and heavy metals tend to be highest in the depositional (muddier) areas.

Groundwater contamination from the oil industry (and historical hydrocarbon infrastructure) is present in some limited areas (e.g. Milford Haven Waterway), typically related to infrastructure failures, accidents and historical war-time events. Pollution to groundwater also contributes to diffuse nutrient input (NRW 2014).

There is pressure from chronic input of hydrocarbons in port and recreational harbour areas, especially Milford Haven Waterway, though indications are that hydrocarbon contaminant loads there are decreasing (Little, 2009). Bioaccumulation of contaminants indicates some levels high enough to cause adverse effects to biota (Langston et al., 2011). There are acute inputs from occasional spills (e.g. Sea Empress) and there remains the potential for further very significant pollution events.

TBT levels are reducing but pressure from use of antifoulants on recreational boats and commercial shipping is still present.

Waste water from mines in mid Wales has resulted in sediments in and adjacent to these catchments having raised heavy metals (Ystwyth/Rheidol).

PF15: Modification of coastline, estuary and coastal conditions for built-up areas

Recorded small losses or modification of habitat are associated with the creation and maintenance of infrastructure along the coast (e.g. Milford Haven Waterway). There are multiple infrastructure development projects in Milford Haven Waterway and Carmarthen Bay, the majority of which are consented. However there are a number of un-regulated coastal defences and shoreline structures particularly in Milford Haven Waterway, these include slipways, gabion baskets, rock armour etc (carried forward from NRW, 2013/2018). Several recorded small losses or modification of habitat are associated with the creation and maintenance of roads, paths and railroads (e.g. Tremadog Bay, 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 (e.g. Milford Haven) (carried forward from NRW, 2013/2018). 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). There are several areas where these defences are at the end of their useful life and are beginning to disintegrate (carried forward from NRW, 2013/2018).

Historic land claim has led to considerable changes in saltmarsh distribution and affected coastal processes within the vast majority of the estuaries and sheltered bays. Sea walls and other coastal defence structures will cause coastal squeeze and changes to sediment transport and supply.

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.

PF17: Active abstraction of water for built-up areas

Reduced flows in rivers result in low flow rates in estuaries and potentially higher concentrations of pollutants from water treatment sites. The impacts of this can be exacerbated by extreme weather associated to climate change.

PG01: Marine fish and shellfish harvesting causing reduction of species/prey populations and disturbance of species (professional) (Medium, ongoing and likely to be in the future)

The condition of commercial fish species populations assessed in the previous Article 17 report, the recent site level condition report (Jackson-Bué, 2025) relevant to Estuaries and commercial fishing pressure on fish species were considered using available ICES/IUCN assessments (ICES reports/IUCN website) in relation to Estuaries.

133 fish species have been recorded in monitoring programmes associated with cooling water abstraction from inshore waters near Pembroke, Hinkley Point and Wylfa power stations, and WFD estuarine fish surveys. These species are reasonably assumed to be representative of the fish species typically present in inshore waters including Estuaries in Wales.

Of the 133 species recorded from inshore waters, 27 species (20%) have ICES advice on commercial fishing in ICES areas 7a, f and g covering Welsh waters (ICES Advice, accessed 2025). The remaining 106 species (80%) are either not commercially fished or have limited/local commercial fishery with no assessment available.

Nine commercially fished species (herring, seabass, cod, whiting, plaice, pollack, horse mackerel, eel and salmon) have stock biomass levels below MSY/MSY proxy in 7a, f and g. Of these 9 species, fishing pressure is assessed as above MSY/MSY proxy for 5 species (herring, cod, whiting, plaice and pollack) in at least one of 7a, f and g, below MSY/MSY proxy for 2 species (seabass, horse mackerel) in 7a, f and g, and not assessed as relative to MSY/MSY proxy for 2 species (European eel and Atlantic salmon), although both these species have zero-TAC advice from ICES but landings occur.

Sixteen commercially fished species (boarfish, anglerfish, haddock, hake, blue whiting, ling, starry smooth-hound, thornback ray, small-eyed ray, spotted ray, sardine, mackerel, lesser-spotted dogfish, nursehound, Dover sole and megrim) have stock biomass levels above MSY/MSY proxy in 7a, f and g. Of these 16 species, fishing pressure is assessed as above MSY/MSY proxy for 8 species (haddock, blue whiting, ling, thornback ray, spotted ray, mackerel, lesser spotted dogfish and Dover sole) in at least one of 7a, f and g, below MSY/MSY proxy for 7 species (boarfish, anglerfish, hake, starry smooth-hound, small-eyed ray, nursehound and megrim) in 7a, f, g, and not assessed as relative to MSY/MSY proxy for sardine, although this species has TAC advice from ICES.

Finally, 2 commercially fished species are not assessed by ICES (blonde ray and sprat) for either their stock biomass or fishing pressure relative to MSY/MSY proxy, although both these species have TAC advice from ICES.

For stock assessments where MSY reference levels cannot yet be provided (and proxy is used), the status is officially unknown (ICES 2024b).

With respect to the IUCN Red List, 2 species (European eel, allis shad) are assessed as Critically Endangered, 1 species (Atlantic salmon) is assessed as Endangered, 1 species (turbot) is assessed as Vulnerable, and 13 species (twaite shad, thick-lipped grey mullet, lumpsucker, seabass, river lamprey, golden grey mullet, thin-lipped grey mullet, starry smooth-hound, blonde ray, thornback ray, small-eyed ray, sardine and nursehound) are assessed as Near Threatened. The remaining 116 species are assessed as either Least Concern or Data Deficient.

Eleven species (herring, cod, whiting, hake, ling, plaice, blonde ray, thornback ray, mackerel, sole, and horse mackerel) with ICES stock assessments covering Welsh waters and recorded in inshore waters relevant to Estuaries are included on the interim Section 7 list (under review) of the Environment (Wales) Act 2016 (Welsh Government, 2016) as they are of principal importance for the purpose of maintaining and enhancing biodiversity in Wales.

Regionally, there is concern about the level of some commercial fish populations (herring, seabass, cod, whiting, plaice, pollack, horse mackerel, European eel and Atlantic salmon). It would be expected that these species would use Estuaries for spawning, nursery, foraging, residing and/or over-wintering. It is unclear how long it will take for these populations to recover; their recovery may also be impacted by other factors such as climate change. While ICES/IUCN assessments provides some wider geographic context, there is limited evidence on the removal of these fish species from the vicinity of Estuaries. The majority of the Welsh fishing fleet is comprised of <10m vessels which predominantly target shellfish (HM Government, 2024), however some vessels will target commercial fish species but only in the largest Estuaries. The abundance of commercial fish species in Estuaries will be influenced by fishing related mortality that does not occur in the Welsh Estuaries themselves, including mortality outside Welsh waters. The data assessed was considered relevant to Estuaries, but low confidence should be associated with this assessment due to the size of the area covered by ICES/IUCN assessments. There is a lack of fisheries data available for the assessment and what data is available are of low confidence in relation to Welsh Estuaries.

Overall, on a UK level, a positive trend towards a greater proportion of fish stocks fished sustainably is evident in both the long term and short term. There is also a positive trend for fish within safe biological limits in the long term, however no change in the short term. For stocks fished sustainably, the percentage of stocks with an 'unknown status' is decreasing and was 23% in 2020 (Lynam et al, 2022, cited by JNCC website, accessed 2025).

Commercial mussel and cockle fisheries occur in Estuaries. HRAs are completed for these fisheries where they may affect SAC features, but not for other areas. Cockle gathering is managed under The Cockle Fishing Management and Permitting (Specified Area) (Wales) Order 2024 with annual cockle stock assessments informing TACs.

Collection of mussel subject to MCRS and HRA, if undersize and potentially affecting SAC features.

Whelk fishing is managed through The Whelk Fishing Permit (Wales) Order 2021 with annual stock assessments completed. Potting for crustacea species are managed through Welsh Government regulations.

PG02: Marine fish and shellfish harvesting causing reduction of species/prey populations and disturbance of species (recreational)

Bait collection (boulder turning for crabs) and crab shelters are present, often in sensitive sheltered and tide-swept habitats. Winkle picking occurs with associated boulder turning.

Bait digging is locally intensive and has generated clear habitat damage and modification in some areas. Voluntary management measures were implemented at the Gann but were not successful, although recent reports show a reduction in activity levels. Further research to clarify the impact and consider the management options available has been carried out. Sensitive habitats such as seagrass at Angle Bay and muddy gravels at Gann Flats are being impacted.

Collection of cockle and razor fish can occur from unclassified beds for personal consumption in Estuaries.

PG03: Marine fish and shellfish harvesting activities causing physical loss and disturbance of seafloor habitats.

Bait collection (boulder turning) and crab shelters are present, often in sensitive sheltered and tide-swept habitats. Bait digging is locally intensive and has generated clear habitat damage and modification in some areas, with sensitive seagrass and muddy gravels impacted (e.g. Milford Haven).

Commercial shellfisheries are active in some areas of Estuaries and include winkle picking (with associated boulder turning and ecosystem effects), mussel laying and harvesting, and cockle gathering. Where the activities may affect SAC features and are regulated, HRAs should be undertaken, though protection for Annex 1 habitats outside MPAs is less stringent. Cockle gathering is managed under The Cockle Fishing Management and Permitting (Specified Area) (Wales) Order 2024 with annual cockle stock assessments informing TACs. Collection of mussel is subject to MCRS and HRA if undersize.

Collection of shellfish for personal consumption also occurs and there is limited but increasing collection of other molluscs (e.g. razor fish) by hand (intertidally, widespread).

	Access to and from shellfish beds or aquaculture assets, particularly vehicular, can, like harvesting activity, cause physical damage or disturbance to sediment habitats and this occurs in some locations. No single fishery is especially extensive , but the aggregation of the wide variety of pressures from fishery activities occurring on the feature could total up to a significant pressure and future threat. The Welsh Government's draft Welsh National Marine Plan identifies opportunities for further development of shellfisheries in Wales. The Plan also contains a series of environmental policies that apply equally to all developments and these are designed to ensure development is sustainable and impacts on protected site feature condition and conservation objectives is mitigated. Where fishing activities are regulated this provides some safeguards to protect Annex I habitats. However, where this is not the case (i.e. outside of Protected Sites or for unregulated fisheries) it leaves mudflats and sandflats under potential threat. Assessed as Low in 2019 Estuaries Report (carried forward without assessment/not reported to JNCC). An assessment of inshore fisheries activity data would be useful to assess this pressure in the future .
7.1: Characterisation of pressures	Pressure narrative continued... PG12: Illegal harvesting, collecting and taking of plants and fungi PG12 is not included within the top 20 pressures but is considered a future threat of medium importance. Unregulated collection of Salicornia spp. is a risk which has been identified however, the scale of collection needs to be assessed. Interest in foraging and foraged food is increasing and the commercial sale of foraged foods may

lead to unsustainable harvesting. Reports of un-consented large scale Salicornia collection on the Dyfi estuary within the Pen Llŷn a'r Sarnau SAC from summer 2024 was likely to have been commercial use (NRW, 2025b). Difficulties in policing such activities in remote locations increase the risk of damage.

PG19: Marine aquaculture generating marine pollution.

Aquaculture, depending on the type, scale and intensity, can cause local water quality changes. For example from elevated suspended sediment on harvest, pickup and relay and from suspended shellfish faeces/pseudofaeces. In those areas where it may affect SAC features, marine aquaculture in Wales is subject to HRA, which will consider water quality impacts.

The WNMP has a sector objective for aquaculture that aims 'to facilitate the development of sustainable aquaculture in Welsh waters, including promoting innovative finfish, shellfish and marine algal businesses and associated supply chains”. The aquaculture resource area identified intersects with large sections of Estuaries. For species already cultivated, the Plan identifies potential for the future development of additional production capacity and options for value added processing. Oysters, scallops, clams and abalone are identified as examples of potential new species for cultivation, along with consideration of potential for sustainable finfish and marine algal aquaculture production. The WNMP also contains a series of environmental policies that apply throughout Welsh seas that should help to ensure that all development is sustainable, including ENV_02: Marine Protected Areas. Where Regulating and Several Orders are applied for, this also provides some safeguards to protect Annex I habitats through HRA processes, although these orders are not compulsory. However, the majority of aquaculture developments require multiple permissions (e.g. landowner lease, FHI, possible marine licence) which are subject to HRA if within or near

EMS (Welsh Government, 2019).

PG21: Introduction and spread of new species in aquaculture (including GMOs).

The spread of INNS from aquaculture is a possibility. There may be pressure for aquaculture expansion into new sheltered areas such as Milford Haven Waterway. Cultivation of triploid Magallana gigas Pacific oysters in the Milford Haven and Menai Strait is considered a threat due to known spread of this species and damage to habitats at other locations in the UK. Climate change will increase the chances of reaching the spawning temperature threshold. Where it may affect SAC features, marine aquaculture in Wales is subject to HRA which should consider INNS impacts.

The WNMP has a sector objective for aquaculture that aims 'to facilitate the development of sustainable aquaculture in Welsh waters, including promoting innovative finfish, shellfish and marine algal businesses and associated supply chains”. The aquaculture resource area identified intersects with Estuaries. For species already cultivated, the Plan identifies potential for the future development of additional production capacity and options for value added processing. Oysters, scallops, clams and abalone are identified as examples of potential new species for cultivation, along with consideration of potential for sustainable finfish and marine algal aquaculture production. The WNMP also contains a series of environmental policies that apply throughout Welsh seas that should help to ensure that all development is sustainable, including ENV_02: Marine Protected Areas. Where Regulating and Several Orders are applied for, this also provides some safeguards to protect those Annex I habitats that are SAC features through HRA processes, although these orders are not compulsory. However, the majority of aquaculture developments require multiple permissions (e.g. landowner lease, FHI, possible marine licence) which may also be subject to HRA (Welsh Government, 2019).

PH08: Other human intrusions and disturbance not mentioned above.

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.

PI01 – Invasive alien species of Union concern

The Chinese mitten crab Eriocheir sinensis is present in the Dee estuary (and Conwy estuary), where there are possible effects on typical species of the estuary, through predation (fish eggs) and reduced water quality due to burrowing into banks higher up the river, although not currently demonstrated to be a problem for native biodiversity or geomorphology. The threat of damage from further invasion across the estuaries of Wales is potentially quite significant.

PI02: Other invasive alien species (other than species of Union concern).

Species of significance include Crepidula fornicata, Magallana (Crassostrea) gigas (see PG21) and Sargassum muticum (Bohn, 2014). Modification of habitat and associated community is observable in areas of high C. fornicata density (particularly Milford Haven Waterway). During this reporting round, C. fornicata has spread from the south-west, into north Wales, although not yet known from the Estuaries. Milford Haven is a hot spot, with a high UK diversity of non-native species being present (Mieszkowska & Sugden, 2025; Wood et al., 2024).

Recent additions to the INNS in the Milford Haven are Didemnum vexillum, Watersipora subatra and Undaria pinnatifida (NRW staff observations).

PI03: Problematic native species

Sea couch Elymus athericus is beginning to spread on some estuaries such as the Severn and the Dee sometimes at the expense of other more species saltmarsh habitat. The increase has generally occurred in response to the absence of grazing or low grazing levels. Once dense patches are established they are difficult to remove (NRW 2025a.

PI04: Plant and animal diseases, pathogens and pests

Grid based monitoring of shellfish populations of estuary sediment flats important for SPA bird features (Burry Inlet, Three Rivers) previously showed a significant decline in cockle populations and cockle population dynamics parameters (population size structure, wet and dry weight). This has been attributed to mass mortality events, precise cause undetermined, but possibly related to parasite load. Recent improvements in cockle abundance have not reinstated previous levels (Moore, 2012). Monitoring of mussel populations (bed area, density, wet & dry weight) shows an increasing trend in most parameters (Moore, 2012).

Bonamia ostreae (parasite of native oysters) is known from oysters in Milford Haven and Menai Strait, within Wales, reducing the resilience of the oysters to other infections and to environmental stress. Bonamia has been identified as part of the reason for reduced expansion of the native oyster population in the Milford Haven (Woolmer et al., 2011; zu Ermgassen, 2017)

PJ01: Temperature changes and extremes due to climate change

Sea surface temperatures have warmed by approximately 0.3oC per decade over the last 40 years (Cornes et al., 2023). However, trends noted less observed warming to the west of the UK, which could include the Welsh coast with values of 0.1-0.2°C increase per decade recorded (Cornes et al., 2023).

Vulnerability of Annex I marine habitats to climate change in Wales, assigned saltmarsh a medium sensitivity threshold for between 23.25°C and 28.25°C to increases in sea temperature. In Wales, 61% of the extent of 'Atlantic salt meadow' habitat within SACs was assessed as having medium vulnerability to increases in sea temperature with 39% assessed as low vulnerability overall (Oaten et al., 2021).

PJ03: Changes in precipitation regimes due to climate change

As the final destination of river flows, increased flow from catchment will change the salinity profile within Estuaries, potentially resulting in shifts in the location and extent of habitats and communities and in their quality. An indirect impact of increased precipitation over land (which is projected to increase over the UK and Wales in winter due to climate change) is increased delivery of sediments, nutrients and pollution from rivers. It is important to note, however, that changes in water quality around the coast would also be affected by other factors such as land and sea use, or pollution from other terrestrial and marine sources, not just changes in riverine discharges (Oaten et al., 2021).

PJ04: Sea-level rise due to climate change

PJ06: Wave exposure changes due to climate change

Changes in abiotic conditions, including sea level rise and wave climate are likely to cause the greatest changes in intertidal sediments 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. 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). Recent assessment has shown very significant losses to all intertidal habitat features from anthropogenic structures causing coastal squeeze within both hold the line policy areas and from assets within 'no active intervention" and 'managed retreat" policy areas. Significant natural losses from coastal squeeze associated with high ground have also been predicted within the assessment period (present to 2155) (Oaten J, et al 2024). Actual losses for intertidal sediments within the period of the Article 17 short-term trend are relatively significant. The Assessment of scale of loss for the period 2005-2025 identified a loss of saltmarsh and intertidal mudflat habitats in the order of 444 Ha. Over this period only about 30Ha of these losses have been compensated for. Although only estimates of loss they were based on old (PAG3) sea level rise projects so it can be assumed that the losses are an underestimate as there have subsequently been two UKCP sea level rise revisions.

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).

For intertidal mud and sand flats 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 current power stations (Milford Haven) due to power station cooling water (NRW Article 17 Intertidal Mud and Sand Flats Report Evidence Pack).

It was also thought that some sediments and reefs would be susceptible to increases in wave exposure if wave exposure increases this is likely to have an impact, however, there isn't evidence to be able to predict this locally (Woolf & Wolf, 2013) (NRW, 2017: NRW Actions Database, Internal data source).

PJ07: Cyclones, storms, or tornados due to climate change

The trajectory of storminess in the future is unclear (Bricheno et al 2025). There is a likelihood that the UK will experience increasing storminess and an intensified wintertime storm track (Bricheno et al., 2023). Increase in wave energy is likely to increase erosion and in more exposed areas prevent saltmarsh developing. Saltmarsh develops in relatively low-energy environments where wave action is limited (Burden et al.,2020). Erosion predominantly affects lower marsh communities which are more vulnerable to wave action, although mid- and high-saltmarsh is susceptible to internal erosion through creek expansion (Burden et al., 2020).

PJ10: Change of habitat location, size, and / or quality due to climate change

PJ11: Desynchronisation of biological / ecological processes due to climate change

PJ12: Decline or extinction of related species (e.g. food source / prey, predator / parasite, symbiote, etc.) due to climate change

PJ10, PJ11 and PJ12 are not included within the top 20 pressures but are considered future threats of medium importance.

The dynamics within an estuary are strongly dependent on wave action and tides at the marine end and alluvial flow at the freshwater end. With changes in parameters such as rainfall and storminess, there is a high likelihood that estuaries will need to form a new equilibrium, which is likely to result in shifts in habitat distribution, type and quality. Sea level rise is a high risk to loss of certain habitats in estuaries.

Climate change and ocean acidification cause direct and indirect pressures which can significantly alter the environmental conditions (e.g. decreases in pH, increases in sea surface temperature) necessary for benthic ecosystem processes and functions (OSPAR, 2023a). Calcifying organisms are thought to be vulnerable to ocean acidification under climate change, with some models predicting up to 13% of cold water coral reefs being in low-aragonite areas (Hoppit & Schmidt 2022, Moore & Smale 2020). Climatic models predict there will be changes to area of suitable habitat in the future depending on the climatic scenario (Moore & Smale, 2020). Other studies suggest ecosystem-level responses could remain stable over long periods of time, depending on the species involved (Moore & Smale, 2020). While confidence in evidence has increased from low to medium, there are still knowledge gaps meaning we are unable to fully assess the scale of benthic species and community responses in relation to climate

PJ13: Change of species distribution (natural newcomers) due to climate change

Offshore, there is evidence to suggest climate change is causing changes in benthic infaunal invertebrate species distributions and range shifts of local species, with some increase in warm-water affinity species especially in the South-West. Climatic models predict this trend will continue

(Moore & Smale, 2020).

PK02: Mixed source marine water pollution (marine and coastal)

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.

PK03: Mixed source air pollution, air-borne pollutants.

Nitrogen input is particularly cumulative in areas with existing high nitrogen loads such as the Milford Haven, where there are inputs from LNG plants and the power station as well as water borne oxides of nitrogen (Edwards,

	2014, Haines & Edwards, 2016). Small amounts of other air born pollutants are likely to be derived from other industries across Wales. PK04: Atmospheric N-deposition There are increasing concerns of raised levels of atmospheric N-deposition from vehicle emissions and intensive farming, which would mostly effect the saltmarsh species directly, but adds to the nitrogen loading that many estuaries are already experiencing from upstream (riverine) increases. Likely causes of Nitrogen deposition are primarily from agriculture and transport, however inputs from transport have declined significantly since 1990 (Department for Transport 2024). The critical load for nitrogen deposition set for Atlantic salt meadows feature is 10-20kg/ha/yr. Approximately 3.9% of this habitat occurs where N-deposition exceeds the critical load. Although only a small percentage of this is likely to be having a detrimental impact, such as the increase in graminoids and increased in late successional species (APIS website), any effects are more likely to be seen in the upper marsh and transitional areas (Boorman and Hazelden, 2012). PL05: Modification of hydrological flow (mixed or unknown drivers) Existing barriers (cobs, walls, embankments) limit the opportunities to restore the feature in Pen Llyn a'r Sarnau. There are future proposals for barrages and other devices that would effect the flow within estuaries, if inappropriately sited.
8.5: List of main conservation measures	MA05: Adapt mowing, grazing and other equivalent agricultural activities (e.g. burning)

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. More recent data are not available.

MA10 Reduce/eliminate point or diffuse source pollution to surface or ground waters (including marine) 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)

MC05 Adapt/manage fossil energy installation, facilities and operation

General regulatory framework for assessment of environmental impacts prior to development, plans and projects.

Consents are required to develop a power station and associated cable lines. Over the past reporting period, for projects that have a capacity of 1-100MW capacity, project developers were required to gain approval from the Marine Management Organisation (Section 36 Electricity Act). In the future, projects will be required to gain approval from Welsh Government (Section 39 Wales Act 2017). For larger projects (>100MW) developers are required to gain approval from the UK government (nationally significant infrastructure projects – Planning Act 2008). For all projects such as these, a marine licence is required under the Marine and Coastal Access Act (MaCAA – HM Government, 2009) and the licence application is reviewed by NRW. Each application requires an Environmental Impact Assessment and Habitat Regulations Assessment (where within or adjacent to a Natura 2000 site). If there are outstanding unresolved issues then they will be subject to monitoring, mitigation or compensatory measures as appropriate. New power stations in the planning pipeline require full review of the likely impacts of entrainment (fish and invertebrates caught in cooling water inlet), chemical additives and local seawater temperature changes.

ME01 Reduce impact of transport operation and infrastructure

General regulatory framework for assessment of environmental impacts prior to development, plans and projects.

MF02 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 (Welsh Government, 2018).

There is however a limitation on the effectiveness of the NHCP in maintaining coherence of the National Site Network as the offset provision only relates to the point at which a man made structure is improved beyond its current design. Consequently a large proportion of the coastal squeeze losses within both hold the line and all other SMP2 policies are continuing to cause an impact on the MPA through coastal squeeze process which is assigned to 'general degradation" (Article 6/2 HD). There is no current funding to support direct mitigation of these losses. The scale of loss is now identified as being very significant (Oaten et al 2024).

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)

MF06: Reduce/eliminate marine pollution from industrial, commercial, residential and recreational areas and activities (incl. contamination with litter)

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.

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%20documents/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. 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.

Diffuse Water Pollution TAP (see below)

Marine Litter TAP (see below)

MF08 Manage changes in hydrological and coastal systems and regimes for construction and development (incl. restoration of habitats).

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 Llŷn 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 as 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).

Modification of coastline, estuary and coastal conditions and the associated hydromorphological pressures on the intertidal habitats of the MPA in particular are fairly synonymous with the 'hold the line” policy areas identified in the SMP2. NRWs Coastal Adaptation Programme is now integrated with the National Habitat Creation with a focus on managing the adaptation of hold the line policy areas subject to particular vulnerability from coastal erosion and rising sea levels. This complex process of assessing the best plan for coastal adaptation and realising opportunities for maintaining the coherence of the National Site Network though marine habitat creation involves developing a portfolio of coastal adaption plans for vulnerable areas around Wales's coastline that have been consulted upon and fully appraised. The projects are managed and delivered by NRWs 'Project and Programme Delivery Team” and typically involve prioritised sites that are evaluated through a five-case business model and due diligence of costs, risks, and benefits, leading to a fully (public and stakeholder consulted) preferred option for sustainable flood risk management. The projects can be delivered in a phased approach governed by available resources, the condition of failing FRM assets and through consultation with Welsh Government (Flood and Coastal Erosion Risk Management) and key stakeholders.

Additional 'mitigation” for impacts on Heavily Modified Water Bodies (HMWBs) through managed realignment and soft engineering or Natural Flood Risk Management also interface with the NHCP and CAP programmes. These also relate to Water Framework Directive drivers for offsetting hydromorphological impacts on the achievement of favourable condition or potential. Habitat creation and its associated tidal exchange into new areas of developing saltmarsh may also support other pressures such as nutrient considerations, as the new habitat will maintain coherence or increase the area of the marine carbon and nutrient cycles.

MG01 Management of professional/commercial fishing, shellfish and seaweed harvesting (incl. restoration of habitats)

Key measures in place to mitigate fisheries related pressures and threats identified in this assessment are driven by UK and Welsh fisheries legislation.

The UK's fisheries management framework is based on the Fisheries Act 2020 (HM Government, 2020) which sets out the legal framework for managing UK fisheries post EU exit. The Act contains seven key objectives to guide decision making including the sustainability objective, the precautionary objective, the ecosystem objective, and the scientific objective.

The Fisheries Act 2020 requires Fishery Policy Authorities to produce Fishery Management Plans (FMPs). FMPs will set out details for managing specific fish stocks or fisheries at maximum sustainable yield or explain why that has not been possible and what needs to be done to achieve MSY. The Celtic Sea and Western Channel Demersal, Irish Sea Demersal, King Scallop, Whelk, Bass, Crab and Lobster FMPs will all be relevant for assessing and managing the interactions of relevant fishing activities with Estuaries fish and shellfish species in Welsh waters. The FMPs will aim to ensure stocks are fished sustainably in line with the ecosystem objective which will include consideration of impacts on benthic habitats. The plans will be reviewed and if necessary updated every 6 years.

The Marine and Coastal Access Act (MCAA) 2009 (HM Government, 2009) aims to improve management and protection of the UK marine and coastal environment. It has eight key elements, including fisheries management and marine enforcement

The Scallop Fishing (Wales) (No.2) Order 2010 (HM Government, 2010) and The Whelk Fishing Permit (Wales) Order 2021 (Welsh Government 2021a) are both assessed annually for their impact on Welsh Estuaries.

Cockle gathering is managed under the Cockle Fishing Management and Permitting (Specified Area) (Wales) Order 2024 with annual cockle stock assessments informing TACs.

In general, the impacts from offshore (outside 12nm) fishing on Welsh Estuaries, by non-Welsh boats, in Wales is poorly understood.

The measure is ranked as Medium as the related pressure and threat PG01, is ranked also as medium and is relevant to a wide area.

Marine Fisheries TAP (see below)

MI03 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.

MJ02 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)

MK01 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)

--

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 - >£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 or 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.

- 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 trends and prospects of parameters	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). 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, so the area of estuary habitat is very slowly decreasing. In addition, there is the ongoing threat of coastal lagoon construction. Stable indicated in 2013 (although minor losses indicated due to coastal defence). Structure and function: The rate of onset of changes due to climate change effects is unclear and the response in water and sediment quality to the measures is also unknown.
10.1: Range	Conclusion on Range reached because: (i) the short-term trend direction in Range surface area is stable; and (ii) the current Range surface area is approximately equal to the Favourable Reference Range.
10.2: Area	Conclusion on Area reached because:(i) the short-term trend direction in Area is stable; (ii) the current Area is approximately equal to the Favourable Reference Area; and iii) there has been no significant change in distribution pattern within range
10.3: Specific structure and functions	Conclusion on Structure and function reached because: i) habitat condition data indicates that more than 25% of the habitat is in unfavourable (not good) condition; ii) short-term trend in area of habitat in good condition is stable; and iii)

	expert opinion determines that there are no significant issues for this habitat.
10.4: Future prospects	Conclusion on Future prospects reached because: (i) the Future prospects for Range are good; (ii) the Future prospects for Area covered by habitat are poor; and (iii) the Future prospects for Structure and function are unknown.
10.5: Overall assessment of Conservation Status	Overall assessment of Conservation Status is Unfavourable-inadequate because two of the conclusions are Unfavourable-inadequate.
11.1: Surface area of the habitat type inside the pSCIs, SCIs and SACs network	(2013 value = 549.59 km2) (2018 value = 555.20 km2)
5.13: Favourable Reference Area (FRA)	The UK-level FRV for surface area was developed by JNCC using an audit trail based on the year the FRV was first established and any changes made in subsequent reporting rounds. The audit may draw from any combination of the 2007, 2013, or 2019 Habitats Directive reports and reflects the full rationale used for the 2019 Article 17 reporting. This FRV was reviewed by Welsh experts and considered appropriate for use in Wales based on current habitat extent and trends.
4.10: Favourable Reference Range (FRR)	The UK-level FRV for range was developed by JNCC using an audit trail based on the year the FRV was first established and any changes made in subsequent reporting rounds. The audit may draw from any combination of the 2007, 2013, or 2019 Habitats Directive reports and reflects the full rationale used for the 2019 Article 17 reporting. This FRV was reviewed by Welsh experts and considered appropriate for use in Wales based on current distribution and trends.