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

2019-2024

Conservation status assessment for the habitat:

S1376-S1377 - Maerl beds

Wales

Cyfoeth Naturiol Cymru
Natural Resources Wales

JNCC

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: S1376-S1377 Maerl beds.

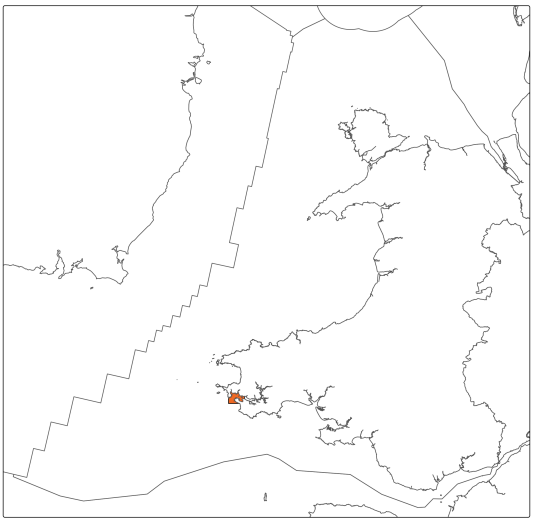
Important note - Please read

- 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: Maerl beds

Distribution Map



Range Map

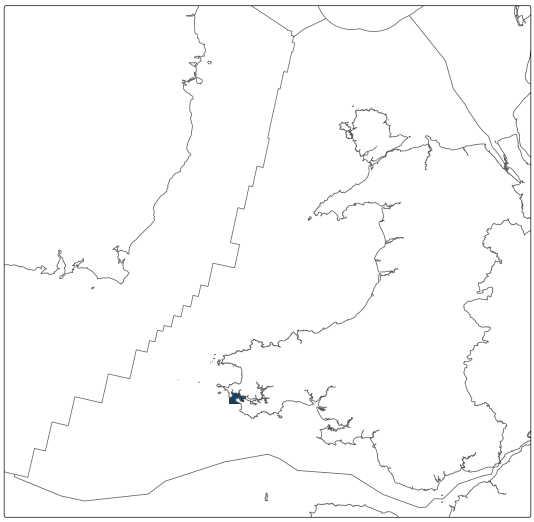


Figure 1: Wales distribution and range map for S1376-S1377 - Maerl beds. Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority. The 10km grid square distribution map is based on available habitat records which are considered to be representative of the distribution within the current reporting period. The range map was developed from the distribution area map.

Table 1: Table summarising the conservation status for S1376-S1377 - Maerl beds. 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-bad (U2)

Breakdown of Overall Conservation Status

Range (see section 4)	**Favourable (FV)**
Area covered by habitat (see section 5)	**Unfavourable-bad (U2)**
Structure and functions (see section 6)	**Unfavourable-bad (U2)**
Future prospects (see section 9)	**Unfavourable-bad (U2)**

List of Sections

National Level 5
1. General information 5
2. Maps 5

Biogeographical Level 5
3. Biogeographical and marine regions 5
4. Range 5
5. Area covered by habitat 7
6. Structure and functions 9
7. Main pressures 10
8. Conservation measures 11
9. Future prospects 12
10. Conclusions 13
11. UK National Site Network (pSCIs, SCIs, SACs) coverage for Annex I habitat types . . 13
12. Complementary information 14

13. References 15
Biogeographical and marine regions 15
Main pressures 19

14. Explanatory Notes 20

National Level

1. General information

1.1 Country	Wales
1.2 Habitat code	S1376-S1377 - Maerl beds

2. Maps

2.1 Year or period	2005-2023
2.2 Distribution map	Yes
2.3 Distribution map; Method used	Complete survey or a statistically robust estimate

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)	200
4.2 Short-term trend; Period	2013-2024
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	Complete survey or a statistically robust estimate
4.6 Long-term trend; Period	
4.7 Long-term trend; Direction	
4.8 Long-term trend; Magnitude	
a) Minimum	
b) Maximum	
c) Rate of decrease	
4.9 Long-term trend; Method used	

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	Expert opinion
e) Quality of information	

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	Yes

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	2005-2023
5.2 Surface area (km²)	
a) Minimum	0.00659
b) Maximum	0.00659
c) Best single value	0.00659
5.3 Type of estimate	Best estimate
5.4 Surface area; Method used	Complete survey or a statistically robust estimate
5.5 Short-term trend; Period	2013-2024
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	Complete survey or a statistically robust estimate
5.9 Long-term trend; Period	2005-2023

5.10 Long-term trend; Direction	Decreasing
5.11 Long-term trend; Magnitude	
a) Minimum	71
b) Maximum	71
c) Confidence interval	
d) Rate of decrease	Decreasing >1% (more than one percent) per year on average
5.12 Long-term trend; Method used	Complete survey or a statistically robust estimate
5.13 Favourable Reference Area (FRA)	
a) Area (km²)	
b) Pre-defined increment	Current area is between 51% and 100% smaller than the FRA
c) Unknown	No
d) Method used	Expert opinion
e) Quality of information	

5.14 Change and reason for change in surface area of range

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

5.15 Additional information

No additional information

6. Structure and functions

6.1 Condition of habitat (km²)	
Area in good condition	
ai) Minimum	0
aii) Maximum	0
Area not in good condition	
bi) Minimum	0.00659
bii) Maximum	0.00659
Area where condition is unknown	
ci) Minimum	0.00001
cii) Maximum	0.00001
6.2 Condition of habitat; Method used	Complete survey or a statistically robust estimate
6.3 Short-term trend of habitat area in good condition; Period	2013-2024
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	Complete survey or a statistically robust estimate
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
PI02: Other invasive alien species (other than species of Union concern)	Ongoing and likely to be in the future	High (H)
PE03: Shipping lanes, ferry lanes and anchorage infrastructure (e.g. canalisation, dredging)	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)
PF05: Sports, tourism and leisure activities	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)
PD05: Development and operation of energy production plants (including infrastructure)	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)
PK02: Mixed source marine water pollution (marine and coastal)	Ongoing and likely to be in the future	Medium (M)
PJ10: Change of habitat location, size, and / or quality due to climate change	Only in future	Medium (M)

PJ11: Desynchronisation of biological / ecological processes due to climate change	Only in future	Medium (M)
PJ12: Decline or extinction of related species (e.g. food source / prey, predator / parasite, symbiote, etc.) due to climate change	Only in future	Medium (M)
PJ13: Change of species distribution (natural newcomers) 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	Restore the structure and functions, including the status of typical species (related to 'Specific structure and functions')
8.3 Location of the measures taken	Only inside National Site Network
8.4 Response to measures	Long-term results (after 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
MF10: Other measures related to residential, commercial, industrial and recreational infrastructures, operations and activities	High (H)

MC05: Adapt/manage fossil energy installation, facilities and operation	High (H)
MF03: Reduce impact of outdoor sports, leisure and recreational activities (incl. restoration of habitats)	Medium (M)
MA10: Reduce/eliminate point or diffuse source pollution to surface or ground waters (including marine) from agricultural activities	High (H)
MF06: Reduce/eliminate marine pollution from industrial, commercial, residential and recreational areas and activities (incl. contamination with litter)	High (H)
MJ01: Implement climate change mitigation measures	Medium (M)
MI03: Management, control or eradication of other invasive alien species	Medium (M)
MG01: Management of professional/commercial fishing, shellfish and seaweed harvesting (incl. restoration of habitats)	Medium (M)

8.6 Additional information

Only part of the measures identified have been taken

9. Future prospects

9.1a Future trends of parameters

ai) Range	Very Negative - decreasing >1% (more than one percent) per year on average
bi) Area	Very Negative - decreasing >1% (more than one percent) per year on average
ci) Structure and functions	Very negative - important deterioration

9.1b Future prospects of parameters

aii) Range	Bad
bii) Area	Bad
cii) Structure and functions	Bad

9.2 Additional information

No additional information

10. Conclusions

10.1 Range	Favourable (FV)
10.2 Area	Unfavourable-bad (U2)
10.3 Specific structure and functions (incl. typical species)	Unfavourable-bad (U2)
10.4 Future prospects	Unfavourable-bad (U2)
10.5 Overall assessment of Conservation Status	Unfavourable-bad (U2)
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 (km^2)

a) Minimum	0.00659
b) Maximum	

c) Best single value	0.00659
11.2 Type of estimate	Best estimate
11.3 Habitat area inside the network; Method used	Complete survey or a statistically robust estimate
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	Complete survey or a statistically robust estimate
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	Complete survey or a statistically robust estimate

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

Androuin, T., Polerecky, L., Decottignies, P., Dubois, S. F., Dupuy, C., Hubas, C., Jesus, B., Le Gall, E., Marzloff, M. P., & Carlier, A. (2018). Subtidal Microphytobenthos: A Secret Garden Stimulated by the Engineer Species Crepidula fornicata. Frontiers in Marine Science, 5.

Barbera, C., Bordehore, C., Borg, J.A., Glémarec, M., Grall, J., Hall-, J. M., De La Huz, Ch., Lanfranco, E., Lastra, M., Mooree, P.G., Mora, J., Pita, M.E., Ramos-Esplá, A.A., Rizzo, M., Sánchez-Mata, A., Seva, A., Schembri, P.J., and Valle, C. 2003. Conservation and management of northeast Atlantic and Mediterranean maerl beds. Aquatic Conserv: Mar. Freshw. Ecosyst. 13: S65–S76

Barnes, R.S.K., Coughlan, J. and Holmes, N.J. 1973. A preliminary survey of the macroscopic bottom fauna of the Solent, with particular reference to Crepidula fornicata and Ostrea edulis. Proc Malacol Soc Lond 40 253-275.

Blake, C. (2005). Use of fossil and modern coralline algae as a biogenic archive. PhD thesis, Queen's University Belfast

Blake, C. and Maggs, C.A. 2003. Comparative growth rates and internal banding periodicity of maerl species (Corallinales, Rhodophyta) from northern Europe. Phycologia 42(6) 606-612.

Bosence, D. & Wilson, J. (2003). Maerl growth, carbonate production rates and accumulation rates in the northeast Atlantic. Aquatic Conservation: Marine and Freshwater Ecosystems, 13, S21-S31.

Bunker, F. StP. D. & Camplin, M. D. 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 MarineSeen. CCW Contract Science Report No. 769. Countryside Council for Wales, Bangor. 174pp + iii.

Bunker, F. StP. D. 2011. Monitoring of a maerl bed in the Milford Haven Waterway, Pembrokeshire, 2010. A report to the Countryside Council for Wales by MarineSeen. CCW Contract Science Report No. 979. 145pp + iii

Bunker, F. St. P. D., Díaz-Tapia, P. and Maggs, C. A. (2017). Monitoring a maerl bed in Milford Haven between 2005 and 2016. NRW Evidence Report No: 213, Natural Resources Wales, Bangor.

Bunker, F. StP, D., Ratcliffe, F. C. 2025. Maerl Bed monitoring in Milford Haven, Wales using diving between 2005 and 2023. NRW Evidence Report No 882. Natural Resources Wales, Cardiff.

CARRO, B., LOPEZ, L., PEñA, V., BáRBARA, I. & BARREIRO, R. 2014. DNA barcoding allows the accurate assessment of European maerl diversity: a Proof-of-Concept study. Phytotaxa, 190, 176-189.

Chauvaud, L., Jean, F., Ragueneau, O. and Thouzeau, G. 2000. Long term variation of the Bay of Brest: benthic-pelagic coupling revisited. Marine Ecology Progress Series 200 35-48.

Dale, J and Mandpipe, S. (In prep.) Milford Haven Maerl Sonde Analysis. NRW Evidence Report, Natural Resources Wales, Cardiff.

Eckard, R. S., Pellerin, B. A., Bergamaschi, B. A., Bachand, P. A. M., Bachand, S. M., Spencer, R. G. M., & Hernes, P. J. (2017). Dissolved organic matter compositional change and biolability during two storm runoff events in a small agricultural watershed. Journal of Geophysical Research: Biogeosciences, 122, 2634–2650. https://doi.org/10.1002/2017JG003935

Edwards P. 2014. Nutrient concentrations in the Milford Haven catchment area. Tech. memo: TMW14-09 Natural Resources Wales. Cardiff.

Grall, J. and Hall-Spencer, J.M. 2003. Problems facing maerl conservation in Brittany. Aquatic Conservation: Marine and Freshwater Ecosystems 13(S1) S55-S64.

Hall-Spencer J, Moore P. 2000. Scallop dredging has profound, long-term impacts on maerl habitats. ICES J Mar Sci. 57(5):1407–15.

Hebog. 2005. Milford Haven Maintenance Dredging Assessment: Biological & Sediment Characterisation. Report to Milford Haven Port Authority. Project No. HE1632.

HM Government (2025). Marine strategy part three: 2025 UK programme of measures. https://www.gov.uk/government/publications/marine-strategy-part-three-2025-uk-programme-of-measures

Holland, M.M., Louchart, A., Artigas, L.F., Ostle, C., Atkinson, A., Rombouts, I., Graves, C.A., Devlin, M., Heyden, B., Machairopoulou, M., Bresnan, E., Schilder, J., Jakobsen, H.H., Lloyd-Hartley, H., Tett, P., Best, M., Goberville, E., McQuatters-Gollop, A., 2023. Major declines in NE Atlantic plankton contrast with more stable populations in the rapidly warming North Sea. Sci. Total Environ. 898, 165505

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.

Lindeque, P., Dimond, A., Harmer, R., Parry, H., Pemberton, K., & Fileman, E. 2015. Feeding selectivity of bivalve larvae on natural plankton assemblages in the Western English Channel. Marine Biology. 162. 10.1007/s00227-014-2580-x.

Lock K. 2021. WFD TraC Nutrient Failures Investigation Report: Milford Haven Outer Coastal Waterbody. Natural Resources Wales, Cardiff

Manac'h, N. 1995. La biodeposition de la crépidule (Crepidula fornicata). Impact sur l'ecosysteme de la rade de Brest. Rapport IFREMER-DEL no. 95-15.

Martin, S., Thouzeau, G., Richard, M., Chauvaud, L., Jean, F., & Clavier, J. 2007. Benthic community respiration in areas impacted by the invasive mollusk Crepidula fornicata. Marine Ecology Progress Series, 347, 51–60. https://doi.org/10.3354/meps07000

Milford Haven Port Authority Dredging Strategy Document (Revision 2), June 2016, Anthony D. Bates Partnership LLP

MCCIP. 2017. Marine Climate Change Impacts: 10 years' experience of science to policy reporting. (Eds. Frost M, Baxter J, Buckley P, Dye S and Stoker B) Summary Report, MCCIP, Lowestoft, 12pp.doi: 10.14465/2017.arc10.000-arc

Mercer, T., Bunker, F. StP, D., Ratcliffe, F. C., & Camplin M., 2025. Milford Haven maerl bed drop down video survey, 2023. NRW Evidence Report No: 880, 34pp, Natural Resources Wales, Cardiff.

Moore, J. and Mercer, T. (2017). 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

NRW. 2017. NRW Actions Database. Internal Data source.

NRW. 2018. 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. 2021. Assessing Welsh Fishing Activities (AWFA) Project - Pots, Traps & Creels Interactions with Maerl. https://naturalresources.wales/awfa?lang=en (Accessed 24/04/2025).

OSPAR, 2023. Benthic Habitats Thematic Assessment. In: OSPAR, 2023: Quality Status Report 2023. OSPAR Commission, London. Available at: https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/thematic-assessments/benthic-habitats/

Pembrokeshire Marine SAC. 2018. Available online: http://www.pembrokeshiremarinesac.org.uk/

Perry, F., Tyler-Walters, H., & Watson, A., 2024. Maerl beds. In Tyler-Walters H. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [Accessed 24-04-2025]. Available from: https://www.marlin.ac.uk/habitats/detail/255/maerl_beds

Ratcliffe, F., in prep. Investigation into the decline of the Milford Haven Maerl bed 2025, Natural Resources Wales, Cardiff

RPS. 2006. Maerl Monitoring – Winter 2005 to Winter 2006. South Hook Jetty, Milford Haven. A report by RPS Planning & Development to South Hook LNG Terminal Company Ltd

RPS PTE. 2006. ROV Maerl Survey. South Hook. For Besix-Kier J.V. JER2580R200905JEv1.1. 20th September 2005.

RPS. 2008. Maerl Monitoring – Winter 2005 to Summer 2008. South Hook Jetty, Milford Haven. A report by RPS Planning & Development to South Hook LNG Terminal Company Ltd.

Scallop Fishing (Wales) (No.2) Order 2010 . Available online: http://www.legislation.gov.uk/wsi/2010/269/made

Schmidt, K., Birchill, A.J., Atkinson, A., Brewin, R.J., Clark, J.R., Hickman, A.E., Johns, D.G., Lohan, M.C., Milne, A., Pardo, S., 2020. Increasing picocyanobacteria success in shelf waters contributes to long-term food web degradation. Glob. Chang. Biol. 26, 5574–5587.

Tavner, D and Camplin M., 2025. HabsRegs9a GIS Processing Notes maerl 2024. NRW internal document.

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

Welsh Government, 2019. Welsh National Marine Plan. https://www.gov.wales/sites/default/files/publications/2019-11/welsh-national-marine-plan-document_0.pdf

Wilson, S., Blake, C., Berges, J. A. and Maggs, C.A. 2004. Environmental tolerances of free-living coralline algae (maerl): implications for European marine conservation. Biological Conservation 120. 283–293.

CCW sidescan. 2009. Side scan of the Milford Haven including the Milford Haven Maerl Bed. Data held internally in NRW.

NRW Thematic Action Plans. Available online: https://naturalresources.wales/about-us/what-we-do/our-projects/our-nature-projects/life-n2k-wales/life-n2k-thematic-action-plans/?lang=en

Main pressures

7.2 Sources of information

No sources of information

14. Explanatory Notes

Field label	Note
2.3: Distribution map; Method used	The assessment is based on a complete survey in 2023 of the Milford Haven Maerl bed. In addition to this, unpublished data from NRW's marine monitoring dive survey in 2023 including video quadrats of maerl at East Tudwal island has been used to inform the range of maerl habitat in Wales. . Complete survey or a statistically robust estimate Systematic survey of maerl condition and distribution has only been undertaken of the maerl bed in Milford Haven. The 2023drop down video and SCUBA diver surveys in 2023 are the best and most recent mapped distribution and therefore are used here. The distribution map is based on records of live maerl from a) Marine Recorder derived point and grid layer (from JNCC) b) Drop down video (DDV) 2005, 2017 and 2023 survey (Bunker & Camplin 2007, Moore & Mercer, 2017, Mercer et al., 2025) C) In situ SCUBA diver 2005-2008 (RPS 2006, RPS 2008), 2005 (Bunker & Camplin 2007), 2010 and 2016 (Bunker 2011, Bunker et al, 2017., Bunker et al., 2025) D) NRW's across Wales marine monitoring diving video quadrat data at East Tudwal Island 2023 (unpublished)
4.3: Short-term trend; Direction	Changes in the 10km square distribution and linked range of Maerl habitat in Wales are considered unlikely in the last 12 years. The apparent reduction in range between now (200km2) and that reported in 2018 (700km2) are due to methodological changes. The 2018 range data used all

	species records from Marine Recorder whereas the 2025 Reg 9A considers Maerl habitat only. The well documented and surveyed maerl bed in the Milford Haven, Pembrokeshire forms the core of the Welsh maerl resource. Historic records of maerl habitat of the south Llyn have been confirmed at East Tudwal Island by NRW's marine monitoring dive survey in 2023. However neither the condition has not been formally assessed nor its extent established but the maerl presence has been deemed to constitute a bed and so has been included in this range and for setting a new FRV.
4.10: Favourable Reference Range (FRR)	A new FRV established for this habitat based on our current knowledge of the historic range of maerl in the early 2000s is 200km2. This includes the Milford Haven Maerl Bed and the more recently confirmed Tudwal Island's maerl bed. See section 4.3. As the FRR and current range are the same the pre-defined reference value of 'less than 2% smaller than the FRR' has been selected.
4.11: Change and reason for change in surface area of range	Narrative in Section 4.3
5.2: Surface area	Best single value (where possible)= min = 0.000005+0.006587 = 0.006592 km2 max= Unknown This is derived form a robust, systematic drop down video survey in 2023 of the Milford Haven Bed. A grid of 628 stations was surveyed with a lightweight dropdown video camera set up and the images analysed to assess live cover and dead maerl cover. A similar method was used to determine the surface area of maerl as was used in the previous assessment in 2013 and 2018 and allows direct comparison of the results from surveys in 2005, 2016 and 2023.

	The minimum figure represents the area of live maerl (km2) within Milford Haven maerl bed. It takes account of the density of live maerl on the ground. It does not represent the bed area within which live maerl is present. The live maerl area was calculated from DDV surveys undertaken in 2023 (Mercer et al., 2025), using a Voronoi/Thiessen process to assign an appropriate area to each data point. The area was then multiplied by the percentage cover of live maerl recorded at each DDV point to provide an overall area of live maerl. See Mercer et al., 2025 for figure showing a map of the live maerl percent cover in the Milford Haven maerl bed derived from the Voronoi polygon interpolation of the 2023 drop down video survey. Methods are given in the GIS processing notes (Tavner and Camplin, 2025). Acknowledged problems: Problems encountered to provide population size estimation: Free-living nodules were best represented by % cover. There were some difficulties determining nodules as live maerl rather than dead maerl nodules that had been recolonised by encrusting coralline algae. In order to mitigate this problem good lighting, high resolution images and a large number of samples were collected so that a reasonable estimation of the covered by live maerl could be made. The East Tudwal Island bed extent has not been surveyed and extent remains unknown. Therefore the maximum area remains unknown. A minimum area of 5m2 has been applied to this bed (20 x 0.25m2 quadrats undertaken in 2023)
5.6: Short-term trend; Direction	Analysis of the 2023 dropdown video survey suggests there has been a short term increase in coverage of live maerl within the Milford Haven Maerl bed when compared to the previous DDV survey in 2016. The proportion of stations where live maerl was recorded

	remained fairly constant, at approximately 20%, across all three surveys. However, in contrast to the long term trend described in section 5.9 below, the average percentage cover of live maerl recorded rose from 0.8% to 1.3%. However this small increase is within the error expected from the visual interpretation of imagery. It is not thought to be associated with a true increase in area of live maerl because live maerl is unable to grow at this rate. Consequently the short term trend has been reported as stable.
5.10: Long-term trend; Direction	Analysis of the 2023 dropdown video survey suggests there has been a significant decrease in coverage of live maerl within the Milford Haven Maerl bed when compared to the previous DDV survey in 2005. The proportion of stations where live maerl was recorded remained fairly constant, at approximately 20%, across the survey periods. However, the average percentage cover of live maerl recorded fell from 5.7% to 1.3%. This equates to a 71% reduction in the live maerl area from 22,537m2 in 2005 to 6,587m2 in 2023. This is coupled with an apparent decrease in the area of dead maerl which has also decreased by 23% from 250,940m2 in 2005 to 192,365m2 in 2023. (Mercer et al, 2025). It should be noted that the deterioration of the maerl bed is supported by substantial deterioration of other monitored parameters such as infaunal diversity (number of taxa and abundance). (Bunker et al, 2017)
5.13: Favourable Reference Area (FRA)	This has been set by NRW to the amount of live maerl area within the Milford Haven maerl bed at South Hook LNG Jetty in 2005 at the time of the first survey (0.0225371 km2). As there has been a drop in area from 22,537m2 to 6,586m2 this equates to the pre-defined FRV increment of 'between 51% and 100% smaller than the FRA'.
6.1: Condition of habitat	In situ fixed station monitoring data has been gathered by SCUBA divers between 2005 and 2023 (6 sites/6 quadrats & cores per site). Four spatially separate monitoring programmes cover this period: RPS monitoring during

South Hook jetty refurbishments (winter of 2005 to summer 2008) (RPS, 2008), CCW monitoring in 2005 and 2010 (Bunker, 2011), NRW monitoring in 2016 (Bunker et al., 2017 and Bunker et al., 2025). Other studies supporting the condition of habitat include a programme of drop down video surveys (approx. 630 drops per survey). (Bunker & Camplin 2007, Moore & Mercer, 2017, Mercer et al., 2025).

The two monitoring programmes provide similar conclusions and show a series of changes over time at the different sites. Overall, there has been a marked decline in live maerl since first surveyed in 2005. This has been reported in the previous maerl species Article 17 Habitats Regulations reporting round (2018), a trend that has not been reversed since the 2016/17 surveys but does not seem to have declined any further in 2023. Any recovery of maerl is likely to be slow given our knowledge of growth rates of between 1 and 1.5 mm per year (Blake and Maggs, 2003).

At most of the six dive monitoring stations, there were significant differences between the epibiota in different years caused by a variety of species. However, no clear trends are found and it is probable that different species are more successful in some years than others. A similar pattern occurred with the infauna.

Although there have been no significant differences in PSA core samples taken at the monitoring stations across years, sedimentation was observed to be high at some sites where most maerl occurred and that fine sediments are known to be detrimental to maerl (Wilson, et al., 2004), it is uncertain whether the maerl at these stations will be able to recover unless sedimentation decreases.

The Invasive Non Native Species (INNS) slipper limpet Crepidula fornicata increased in abundance between 2005 and 2016 but has since decreased again in 2023. The invasion of C. fornicata poses significant threats to maerl

	beds, disrupting ecosystem function and affecting biodiversity. C. fornicata competes with native species for space within maerl beds. Their presence results in direct deposition of organic matter in the form of pseudofaeces (Martin et al., 2007), which can clog interstitial spaces between maerl thalli. Additional dissolved metabolites from these gastropods act as a fertiliser, stimulating growth of microphytobenthic biofilms (Androuin et al., 2018). The Milford Haven Maerl bed is also within the failing Milford Haven Outer Coastal Waterbody. This waterbody has failed to meet the minimum standards for Dissolved Inorganic Nitrogen (DIN). In Cycle 3 (2021) it was classified as Moderate and in Interim Cycle 3 (2024) a poor. An investigation (Lock, 2021) has been carried out and confirms the failure and has identified several Reasons for Not Achieving Good (RNAGs). Further information regarding this is in Section 7.1 Habitat Main Pressures.
6.4: Short-term trend of habitat area in good condition; Direction	Maerl was previously reported as a species Habitat and Species Regulations Article 17 reporting and so the 'area in good condition' was not reported as a metric previously. The short-term trend reported here was determined by comparing two separate repeat monitoring programmes (diving and drop down video) in 2016/7 and 2023 as described in Section 6.1 above. There hasn't been any area of maerl bed reported in good condition over this period, so although the area of reported bad condition has fluctuated slightly over that period (due to acknowledged inaccuracies in visual interpretation of seabed imagery) The area in good condition of the bed has been consistently zero. The two Milford Haven maerl species were reported in the 2013 Article 17 report to have a 'bad' quality of habitat and similarly, in 2018 was also reported that the quality of the habitat was insufficient.
7.1: Characterisation of pressures	The identified pressures and threats set out here relate predominantly to those affecting the maerl bed in Milford

Haven, which is the main location of maerl in Welsh waters. They are based on human activities that do, and will probably continue to, interact with the maerl bed in Milford Haven and also encompass recorded and/or reported changes in environmental conditions that are relevant to maerl growth and survival in Milford Haven. All pressures identified are supported by formal record, observation, primary or grey literature.

An investigation into the decline in the condition of the Milford Haven maerl bed, is currently underway as part of the Nature Networks (NN) 2025 program. The NN initiative is a Welsh Government-funded, multi-year program aimed at improving the condition of protected sites across Wales, addressing both the nature and climate emergencies. As part of this program, the 'Investigation Into Declines in Benthic Habitats and Species' project seeks to identify the causes behind significant declines observed in certain benthic habitats and species, particularly those within the Marine Protected Areas (MPA) Network in Wales, such as maerl. The investigation report (Ratcliffe, in prep) outlines the background, rationale, findings, and management recommendations for the bed. A part of the investigation includes a compilation of historic and current pressures and has been used to support the pressures listed here.

PI02: Other invasive alien species (other than species of Union concern), (Pressure: H, 3, ongoing and likely to be in the future). The presence of Slipper Limpet Crepidula fornicata in the maerl bed has increased dramatically since 2005. Although the numbers of C. fornicata reduced in the most recent (2023) drop down video survey, it is one of the factors thought to be responsible for increased silty fine particle fraction of the seabed sediment. (Ratcliffe, in prep).

Crepidula 'reefs' trap silt, reduce particle resuspension and speed up sedimentation rates (Barnes et al., 1973). Active pumping during feeding leads to bio-deposit sedimentation rates faster than that of other suspended matter (Chauvaud

et al. 2000). Studies by (Manac'h, 1995) showed that bio-deposition by Crepidula leads to sediment organic enrichment and Chauvaud et al. (2000) discuss how the increased biodeposition leads to increased diatom production on the sediment which is food for both herbivores and surface deposit feeders.

Grall and Hall-Spencer (2003) describe how live maerl thalli become covered in Crepidula and the interstices in the maerl sediments become clogged with silt, killing maerl thalli and dramatically altering the associated maerl communities. Wilson et al. (2004) demonstrated, using experimental techniques, that a major hazard for live maerl and the rich communities that depend on them is the smothering by fine sediment.

Maerl is particularly sensitive to increases in siltation and therefore the presence of Crepidula in the bed is ranked as both a high pressure and threat (due to the high likelihood of the current Crepidula population increasing in the future).

PE03: Shipping lanes, ferry lanes and anchorage infrastructure (e.g. canalisation, dredging), (Pressure: H, 3, ongoing and likely to be in the future)

Milford Haven is a busy commercial deep water port. 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.

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.

PA17 Agricultural activities generating pollution to surface or ground waters (including marine), (Pressure: H, 3, ongoing and likely to be in the future)

Although there are many substantial discharges to the estuary including from sewage treatment works, the petrochemical industry and energy production industry, nutrient loading from agricultural runoff and inappropriate use does represent a significant input (Lock, 2021) where nutrient loading is already high. The Milford Haven Outer Coastal Waterbody has had failures in Dissolved Inorganic Nitrogen (DIN) In the Cycle 3 (2021) and Cycle 3 Interim (2024) reporting rounds. Elevated levels of DIN can lead to algal blooms, causing a reduction in dissolved oxygen and raised levels of anoxia. This has the potential to disrupt complex food chains in the system, disrupting the delicate balance between invertebrate populations, biomass, waterfowl populations, sediment flats and salt marsh structure, function and community structure (Edwards, 2014).

PF05: Sports, tourism and leisure activities (Pressure: M, 3, ongoing and likely to be in the future).

Anchoring impacts from recreational craft, largely anglers. A voluntary management measure to exclude anchoring within the maerl bed has been established but its effectiveness is as yet unknown (lack of compliance monitoring).

PF10: Residential, commercial and industrial activities and structures generating marine pollution, (Pressure: M, 3, ongoing and likely to be in the future).

Substantial discharge from Sewage Treatment plants elevate the levels of nutrients significantly in the Milford Haven where nutrient levels are already high (Lock, 2021). This contributes to elevated levels of eutrophication (including increased plankton and epiflora resulting in reduced light and increased siltation).

PD05: Development and operation of energy production plants (including infrastructure), (Pressure: M, 3, ongoing and likely to be in the future).

The effluent from the 2000 megawatt Pembroke Power Station contributes to elevated levels of eutrophication (including increased plankton and epiflora resulting in reduced light and increased siltation). This may affect species distribution as well as contributing to elevated levels of eutrophication (including increased plankton and epiflora resulting in reduced light and increased siltation).

The Pembroke Power Station uses 'once through' cooling water extracted from the Milford haven, raising the ambient temperature of the discharged water by 8 degrees Celsius. This causes an increase in ambient temperature across the whole of the Milford Haven Waterway. This may affect species distribution as well as contributing to elevated levels of eutrophication (including increased plankton and epiflora resulting in reduced light and increased siltation).

There has been deposition of construction material from the jetty refurbishment works directly on the maerl bed previously. Shot blasting of piles has led to contaminated material being deposited onto the maerl bed. In addition to this, there are a large number of industrial structures in the area surrounding the Milford Haven that, if left abandoned, could potentially result in a pollution incident, which contributes to the threat ranking in this assessment.

PE07: Land, water and air transport activities generating marine pollution, (Pressure: M, 3, ongoing and likely to be in the future).

This pressure and threat relates to general pollution in the busy industrialised part of the Milford Haven where there are many activities operating closely together. This includes minor spills or discharge of petrochemicals and other chemicals from vessels.

PK02: Mixed source marine water pollution (marine and coastal), (Pressure: M, 3, ongoing and likely to be in the future).

General mixed source pollution through general industrialisation of the area surrounding the Milford Haven. WFD chemical failure (Mercury). A threat of major oil spills such as the Sea Empress disaster (which was berthed following the spill at the head of the jetty that bisects the maerl bed) and significant oil industry catastrophic failures and leaks. Input of contaminated waste from jetty refurbishment works.

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

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

(Pressure Medium:M, 4, in the future)

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, 2023). 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 change for broadscale habitats (Moore & Smale, 2020).

As a result of warming seas, there is evidence of major declines in plankton abundances in the NE Atlantic (~50% decline in copepod abundance over the last ~60yrs), shifting to a 'microbial food web” driven by picophytoplankton e.g. Synechococcus (Schmidt et al. 2020; Holland et al. 2023). Synechococcus is a poor primary producer due to its small size and lack of essential fatty acids (Lindeque et al. 2015). Changes such as this are likely to affect entire food-webs and a particular at-risk group would be filter-feeders such as found within reef

communities.

PJ01: Temperature changes and extremes due to climate change,

PJ03 Changes in precipitation regimes due to climate change

PJ14 Other climate related changes in abiotic conditions (ocean acidification).

(Pressure: L, 4, Only in the future).

Thermal effects as a consequence of climate change are likely to be indirect (e.g. through plant growth, shading, silt deposition and anoxia). Temperature has risen in MHW by 0.97 degrees since 1982. Temperature changes can affect responses to other pressures, positively and negatively, however maerl is tolerant to increase in temperatures (Perry et al, 2024). Water quality is dependent on levels of precipitation (e.g. silt and other agricultural/urban runoff and SWOs). Changes in wave energy (storminess) are likely to change the habitat suitability since the area is exposed to south west swells. Potential effects of ocean acidification on maerl is unknown, but the structure of maerl is carbonate based. Rises in sea level will reduce light levels to the maerl. Changes in rainfall due to climate change may alter sedimentation and turbidity as well as estuarine salinity.

Benthic invertebrates and macroalgal species distributions and range shifts of local species, with some increase in warm-water affinity species especially in the South-West.

PG03: Marine fish and shellfish harvesting activities causing physical loss and disturbance of seafloor habitats. (Pressure: L, 3, ongoing and likely to be in the future).

Historically, there is evidence that scallop dredging

	occurred over the maerl bed. However, 2010 scallop fishing restrictions now prohibit this. While no current trawling is believed to occur on the maerl beds, the Assessing Welsh Fishing Activities (AWFA) project suggests that one pass of trawl gear could cause lethal damage to a maerl bed. While recovery could occur after trawl damage, due to slow growth rates this may take many decades. Repeated damage from trawling would further reduce the rate of recovery or the maerl bed may not recover at all. Whelk potting has not been allowed on the maerl beds since 2021. Currently, there is a low level of static pot fishing for crustacea species in the area that could cause a low pressure on the maerl bed. This pressure will be assessed during implementation of the new Welsh Crab and Lobster Fisheries Management Plan due to be published in 2026. MarLIN (www.marlin.ac.uk/) has assessed Maerl to have a high sensitivity to abrasion and penetration (Perry et al., 2024). The AWFA Project suggests the impact from pots, weights or anchors making contact with Maerl would cause permanent or long-term physical damage to the biogenic structure (NRW, 2021).
8.1: Status of measures	Whilst some measures have been taken to address the issues, further interventions are needed but the mechanisms have not been resolved, and in reality, many of the issues are not yet understood.
8.5: List of main conservation measures	MF10: Other measures related to residential, commercial, industrial and recreational infrastructures, operations and activities (H) MC05: Adapt/manage fossil energy installation, facilities and operation (H) These measures cover the HRAs that have been completed for construction projects, to ensure no significant effect on site integrity within marine Natura 2000 sites. This measure is ranked High due to its importance in reducing impacts on Welsh reef habitat from construction

and development projects within SACs.

Before undertaking any dredging works, Milford Haven Port Authority have to consider the effects the activity will have on water quality in the surrounding area. Various options are considered as to which dredging methodology should be used in order to reduce the environmental impacts.This includes a restricted regime to control overflow of hopper during dredging in place when dredging material with a fine sediment composition. This reduces the input of highly turbid water overflowing from dredging vessels. This is a positive way to reduce the impact of dredging and is welcomed by NRW.

Milford Haven Port Authority Dredging Strategy Document (Revision 2), June 2016, Anthony D. Bates Partnership LLP

MF03 Reduce impact of outdoor sports, leisure and recreational activities (incl. restoration of habitats) (M)

A voluntary 'no anchoring' zone in the Milford Haven over the maerl bed has been agreed in order to reduce the direct physical impact that anchoring on the seabed has. This is a positive step and is supported by NRW.

A Voluntary Agreement for the Protection of Sensitive Habitat Zones of Subtidal Seagrass and Maerl in Milford Haven between Milford Harbour Users Association (MHUA) and Pembrokeshire Marine Special Area of Conservation (SAC) Relevant Authorities Group (RAG)

https://www.pembrokeshiremarinesac.org.uk/marine-code-work/

MA10: Reduce/eliminate point or diffuse source pollution to surface or ground waters (including marine) from agricultural activities (H)

Thematic Action Plan: Diffuse Water Pollution –

Key measures which are in place to mitigate water quality related pressure and threats identified in this assessment are driven by European legislation and cover the wider sea area: The Water Framework Directive (WFD) aims to maintain the 'high and good status” of waterbodies, prevent any deterioration in the existing status of waters and to restore to at least 'good status” in relation to all waterbodies. The mechanism by which this is to be achieved under the WFD is through the adoption and implementation of River Basin Management Plans and Programmes of Measures for each of the identified River Basin Districts. The Programme of Measures will be incorporated into the delivery plan for updated river basin management plans. Many measures planned aim to deal with issues causing WFD coastal and estuarine waterbody failures for ecological and chemical elements. The Programme of Measures delivers many of the statutory requirements for other directives and associated legislations e.g. Marine Strategy Framework Directive, Urban Waste Water Directive, Bathing Waters Directive and Eel Regulations.

Shared multi-agency pollution response plans to deal with major incidences are in place and are regularly updated.

MF06: Reduce/eliminate marine pollution from industrial, commercial, residential and recreational areas and activities (M)

Key measures which are in place to mitigate water quality related pressure and threats identified in this assessment are driven by European legislation and cover the wider sea area: The Water Framework Directive (WFD) aims to maintain the 'high and good status” of waters where it exists, prevent any deterioration in the existing status of waters and to restore at least 'good status” in relation to all waters. The mechanism by which this is to be achieved under the WFD is through the adoption and implementation

of River Basin Management Plans and Programmes of Measures for each of the identified River Basin Districts. The Programme of Measures will be incorporated into the delivery plan for updated river basin management plans. Many planned measures aim to deal with issues causing WFD coastal and estuarine waterbody failures for ecological and chemical elements. The Programme of Measures delivers many of the statutory requirements for other directives and associated legislations e.g. Marine Strategy Framework Directive, Urban Waste Water Directive, Bathing Waters Directive and Eel Regulations.

The UK Marine Strategy identifies marine litter as a descriptor of clean seas (Descriptor 10) and requires UK administrations to ensure that 'properties and quantities of marine litter do not cause harm to the coastal and marine environment' (HM Government, 2025). As a Contracting Party to the OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic, UK government in collaboration with devolved governments is also developing and implementing actions under the OSPAR Regional Action Plan for Marine Litter to 'prevent inputs of and significantly reduce marine litter, including microplastics, to reach levels that do not cause adverse effects to the marine and coastal environment with the ultimate aim of eliminating inputs of litter”. The Action Plan has three key themes: actions to reduce land-based sources of marine litter, actions to reduce sea-based sources of marine litter and cross cutting actions.

In Wales, the Welsh National Marine Plan (Welsh Government, 2019) encourages action to reduce litter in the marine environment (ENV_04) and requires developers to consider how to prevent or minimise marine litter in their proposals. The Wales Clean Seas Partnership, part of the United Nations Clean Seas Campaign and Global Partnership on Marine Litter is a multi-stakeholder group which develops and delivers the Marine Litter Action Plan for Wales. Welsh Government funds Keep Wales Tidy and

Natural Resources Wales' Fly Tipping Action Wales Programme, which work to enable proper waste management and prevent fly tipping which can be a source of marine litter. In 2021, Welsh Government published the Beyond Recycling Strategy (Welsh Government, 2021b), to implement a circular economy in Wales. This encourages proper waste management and commits to phase out single-use plastics which could end up as marine litter. In 2023, the Welsh Government launched the Environmental Protection (Single-use Plastic Products) Act (Welsh Government 2023), which bans the sale and supply of selected single use plastic items, such as plastic cutlers and straws, many of which are commonly found as marine litter. Future exemptions are likely to also include wet wipes and single use vapes.

Voluntary organisations undertake litter removal at specific locations. This includes beach cleans (organised by local groups or the marine conservation society) and subtidal litter removal (NARC, 2015; 2016) based in southwest Wales.

Actions Identified by the actions database (site level) include:

Direct management is the most frequently identified mechanism for addressing marine litter impacts. This mechanism predominantly refers to action required by Local Authorities (LA) to support and help implement measures to remove litter from beaches (e.g. third-party collections and LA beach cleaning), ensuring that approaches are sensitive to features.

Investigation actions principally relate to improving the evidence base to underpin better management and reduce both sources of marine litter and impacts on features. This includes investigations to develop better understanding of local sources of marine litter and its disposal, and identification of high-risk areas for marine litter.

Targeted education, awareness raising and liaison actions include, for example, developing opportunities to reduce litter at source (locally), including site level awareness.

MI03 Management, control or eradication of other invasive alien species

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. Marine INNS Pathway Management in Wales will help deliver the above.

MJ01: Implement climate change mitigation measures (M)

The UK, including Wales, has implemented various conservation measures to mitigate climate change impacts, focusing on carbon reduction, habitat restoration, and sustainable resource management.

One major initiative is the UK's net-zero by 2050 target, which Wales supports through its Net Zero Wales plan under the Environment (Wales) Act 2016. This includes decarbonising industries, investing in marine renewables like floating offshore wind farms in the Celtic Sea, and restoring natural carbon sinks (Welsh Government, 2021c). There is growing focus on marine and coastal restoration of habitats such as salt marsh, seagrass and native oyster, all of which are important for blue carbon storage. A number of projects to restore these habitats right across Wales, and a further focus on restoration is supported by WG's

Programme for Government commitment to put in place targeted programmes of restoration for sea grass and salt marsh.

Habitat conservation plays a crucial role in climate mitigation. For example, peatland restoration is a key focus in Wales, as peatlands store vast amounts of carbon. The National Peatland Action Programme aims to restore 600-800 hectares of peatland per year, with projects in Eryri (Snowdonia), Bannau Brycheiniog (Brecon Beacons), and the Cambrian Mountains (NRW, 2022). Similarly, the National Forest for Wales is expanding tree planting to improve carbon sequestration and biodiversity.

Wales is also reforming agriculture under the Sustainable Farming Scheme, which rewards farmers for climate-friendly practices like soil conservation and agroforestry.

These conservation efforts, combined with emissions reduction policies, contribute to Wales' climate resilience strategy.

MI03: Management, control or eradication of other invasive alien species. (M)

Legislative agreements seek to protect biodiversity, species and habitats, and include provisions requiring measures to prevent the introduction, spread and control of, invasive non-native species (INNS), especially those that threaten native or protected species and habitats.

The UK is a signatory to the Ballast Water Convention which aims to prevent the spread of harmful aquatic organisms by establishing standards and procedures for the management and control of ships' ballast water and sediments. These include specific ballast water management standards (e.g. concerning the efficacy of water exchange), the requirement for international vessel traffic to manage ballast water and sediments in

accordance with vessel-specific ballast water management plans, and for all such vessel to carry a ballast water record book and an international ballast water management certificate.

Through its implementation of the Marine Strategy Framework Directive (MSFD), the UK aims to ensure that INNS introduced by human activities are at levels that do not adversely alter the ecosystems. The UK's Marine Strategy includes targets to reduce the risk of introduction and spread of non-native species through improved management of high risk pathways and vectors, and for action plans to be developed for key high-risk marine non-indigenous species by 2020. The strategy also sets out indicators for Good Environmental Status (GES) in respect of these INNS targets, and monitoring programmes for measuring progress towards achieving or maintaining GES. In Wales, various statutory and ad-hoc monitoring programmes contribute towards the MSFD INNS evidence baseline. Examples include marine rapid assessment surveys of Welsh marinas carried out in 2011 and 2014 (Sambrook et al., 2014). Contingency plans are currently being developed for priority marine INNS species not yet established in Wales. Where potentially high impact INNS have been detected historically, innovative approaches to rapid eradication or control have been implemented where appropriate/technically feasible (e.g. Didemnum vexillum at Holyhead Marina).

The impacts associated with INNS are also recognised as potentially significant anthropogenic pressures through the UK's approach to implementing the Water Framework Directive. Impacts from invasive non-native species are considered as part of the assessment of the ecological status of water bodies and, in general terms, measures are adopted to improve status and address impacts, on a water body by water body basis, where INNS are implicated in a water body failing to achieve its objectives.

In Wales, anthropogenic activities with the potential to introduce or spread INNS are managed through the implementation of biosecurity risk assessment and management planning under existing regulatory and consenting frameworks. Examples include the marine licensing provisions of the Marine and Coastal Access Act 2009, Habitats Regulations Assessments under the Conservation of Habitats and Species Regulations 2017 and Sites of the Special Scientific Interest (SSSI) consenting procedures under the Wildlife and Countryside Act 1981.

Natural Resources Wales and the Welsh Government are standing members of the UK Marine Pathways Group, a coordinated approach to preventing new INNS introductions, early detection and rapid action to prevent the establishment of INNS, and containment and long-term control measures across the UK and Ireland. The Marine Pathways Group, in its earlier project form, produced specific INNS guidance and voluntary best practice for marina operators, boat owners and the aquaculture sector, and led on the identification of locations at high risk of introduction where biosecurity efforts should be focused.

MG01 Management of professional/commercial fishing (including shellfish and seaweed harvesting) (M)

Dredging for scallops in Milford Haven is banned under The Scallop Fishing (Wales) (No.2) Order 2010 but was known to occur on the maerl bed in the past (e.g. in 2006 & 2011 during the jetty construction). This is a positive step and will reduce direct physical impact to any pockets of maerl that remain around the Welsh coast and particularly to the main bed in the Milford Haven. Whelk fishing on the Milford Haven maerl bed has not been permitted since the introduction of The Whelk Fishing Permit (Wales) Order 2021. The new 2026 Welsh Crab and Lobster FMP will assess the impacts from potting for crustacea on maerl during implementation.

9.1:Future trends and prospects of parameters	Future prospect of range Given that there are multiple complex issues affecting this habitat with a lot of uncertainty surrounding the causes of its decline, and the very slow growing nature of the maerl, the opinion is that there is a significant risk the Milford Haven maerl bed will ultimately be lost. If the Milford Haven bed deteriorates any more (which we can assume it may based on the 20 year long term trend), then it is likely that what we have will no longer meet the definition of what constitutes a maerl bed. At which point, we will lose a 10 km grid cell per bed ie the range will fall by 50% per bed. The Tudwal Island maerl bed has only had a very limited survey but this has shown the bed to be in an equally poor state. As a result we consider the future prospects of Range to be very negative. Future prospect of area The area of Live maerl has fallen dramatically since it was first surveyed 20 years ago and this is reflected in the long term trend in area (Section 5.10). Although the most recent survey showed signs that the area has not continued to fall, it has remained stable at a low level. There are many pressures (historic and ongoing) on the maerl bed and the situation is complex. This, combined with the slow growth rate of maerl, the uncertainty as to the cause of the decline and that we have no management measures in place that we know will aid recovery, it is expected that the future prospects of area to be very declining – bad. Future prospect of structure and function The future prospects for the structure and function of the maerl beds are very negative due to the complexity of the factors affecting it. Increases in sedimentation are likely to

	be a response from a variety of sources. The control of invasive non-native species and the effects of Crepidula fornicata are not easily resolved. The high levels of Dissolved Inorganic Nitrogen are also a complex issue and not easily resolved. Therefore the future prospects are bad due to the uncertainty with the effectiveness of current and future conservation measures at relieving pressures.
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 more than 10% below 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 significant issues for this habitat.
10.4: Future prospects	Conclusion on Future prospects reached because: (i) the Future prospects for Range are bad; (ii) the Future prospects for Area covered by habitat are bad; and (iii) the Future prospects for Structure and function are bad.
10.5: Overall assessment of Conservation Status	Overall assessment of Conservation Status is Unfavourable-bad because three of the conclusions are Unfavourable-bad.
11.3: Surface area of the habitat type inside the network; Method used	Further information in Section 5.2
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. Following expert review, a Wales-level FRV was derived based on habitat extent and trend evidence specific to Wales, rather than adopting the UK-level value. The revised FRV has been set by NRW to the amount of live maerl at the Milford Haven Maerl Bed at South Hook LNG Jetty in 2005 at the time of the first survey (0.0225371 km2). As there has been a drop in area from 22,537m2 to 6,586m2 this equates to the pre-defined FRV increment of 'between 51% and 100% smaller than the FRA'.
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. Following expert review, a Wales-level FRV was derived based on distribution and trend evidence specific to Wales, rather than adopting the UK-level value. The revised FRV has been set as the range is known (Milford Haven Maerl Bed and East Tudwal Islands) and unchanged. As the FRR and current range are the same the pre-defined reference value of 'less than 2% smaller than the FRR' has been selected.