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

2019-2024

Conservation status assessment for the habitat:

H1170 - Reefs

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: H1170 Reefs.

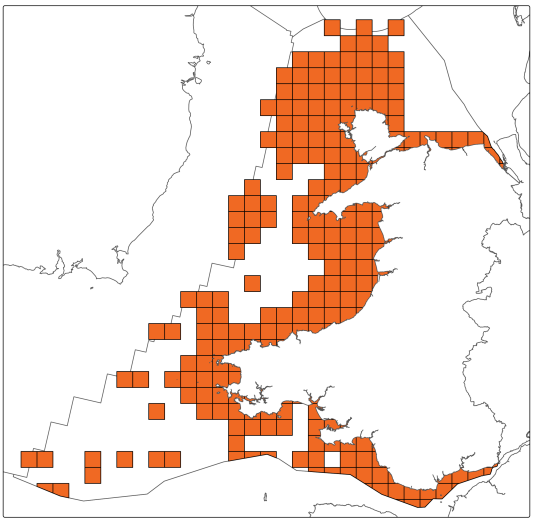
Important note - Please read

- 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: Reefs

Distribution Map



Range Map

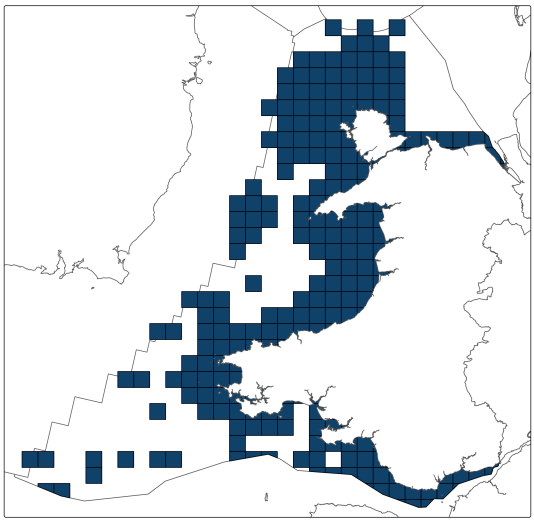


Figure 1: Wales distribution and range map for H1170 - Reefs. Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority. The 10km grid square distribution 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 H1170 - Reefs. 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)	**Unknown (XX)**
Area covered by habitat (see section 5)	**Unfavourable-inadequate (U1)**
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	H1170 - Reefs

2. Maps

2.1 Year or period	1996-2024
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)	3,411
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	Based mainly on extrapolation from a limited amount of data
4.6 Long-term trend; Period	1996-2024
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	
c) Unknown	Yes
d) Method used	
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

Offshore and inshore split of range surface area (4.1) values including biogenic and rocky reef. Values in brackets represent the percentage of total Welsh reefs:

Combined inshore and offshore value: 3,411 km2

Rocky = 3389 km2 (99.4%) Biogenic = 22 km2 (0.6%)

Inshore 3152 km2 (92.4% of total Reef in Wales)

Rocky = 3130 km2 (99.3%) Biogenic = 22 km2 (0.7%)

Offshore 259 km2 (7.6% of total Reef in Wales)

Rocky = 259 km2 (100%) Biogenic = 0 km2 (0%)

Note, the inshore value provided by JNCC is slightly different to that calculated by NRW. However, as all other area calculations in this document are based on NRW's inshore values, it is more appropriate to report the NRW's value rather than JNCC's.

5. Area covered by habitat

5.1 Year or period	2019-2024
5.2 Surface area (km²)	
a) Minimum	
b) Maximum	
c) Best single value	3,411
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	2013-2024
5.6 Short-term trend; Direction	Decreasing
5.7 Short-term trend; Magnitude	

a) Estimated minimum	0.05
b) Estimated maximum	0.05
c) Pre-defined range	
d) Unknown	No
e) Type of estimate	Best estimate
f) Rate of decrease	Decreasing <=1% (one percent or less) per year on average
5.8 Short-term trend; Method used	Based mainly on extrapolation from a limited amount of data
5.9 Long-term trend; Period	1994-2024
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	
c) Unknown	Yes
d) Method used	
e) Quality of information	

5.14 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	No
e) No information	No
f) Other reason	No
g) Main reason	Improved knowledge/more accurate data

5.15 Additional information

Combined inshore and offshore value: 3,411 km2

Rocky = 3389 km2 (99.4%) Biogenic = 22 km2 (0.6%)

Inshore 3152 km2 (92.4% of total Reef in Wales)

Rocky = 3130 km2 (99.3%) Biogenic = 22 km2 (0.7%)

Offshore 259 km2 (7.6% of total Reef in Wales)

Rocky = 259 km2 (100%) Biogenic = 0 km2 (0%)

6. Structure and functions

6.1 Condition of habitat (km²)

Area in good condition	
ai) Minimum	1,300.7
aii) Maximum	1,300.7
Area not in good condition	
bi) Minimum	1,082.5
bii) Maximum	1,082.5
Area where condition is unknown	
ci) Minimum	1,020.5
cii) Maximum	1,020.5
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	
6.4 Short-term trend of habitat area in good condition; Direction	Unknown
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).

Inshore Results:

Welsh Government Scallop fishing vessel activity 2012 to 2022 methods:

This layer represents the total scallop fishing vessel activity over the 2012 to 2022 scallop fishing seasons. The scallop fishing season runs from 1st November to 30th April. Since 2012, vessels fishing for scallops in the Welsh scallop fishery have been required to install a Vessel Monitoring System (VMS). The VMS records the location, speed, and heading of the vessel. Each record is referred to as a ‘ping’. We have filtered the data to remove any ‘pings” where vessels are not fishing. We have assumed that vessels are fishing when travelling between 1 and 4 knots, and that no fishing occurs within 1km of ports. We have aggregated the filtered data to show the number of pings per 0.01 degree grid cell. In order to protect the anonymity of fishers, no data is shown for cells containing data from less than 3 vessels.

Key caveats and considerations when interpreting Welsh Government Scallop fishing vessel activity data:

• Vessels are assumed as fishing when travelling between 1 and 4 knots. This can lead to an overestimation in fishing activity as it is possible the boat is not fishing and traveling less than 4knots.

• Scallop fishing activity is assumed to be homogeneous in distribution throughout 0.01 degree cell. This assumption can result in an overestimate of the extent of fishing pressure and an underestimate of intensity of fishing pressure within a cell. It should be noted, this assumption is due to the Welsh Government's spatial display restrictions of VMS based fishing activity dataset.

• Conversely, distribution and / or intensity of fishing pressure may be underestimated due to no VMS data for vessels less than 12m in length. Such vessels predominantly operate in coastal areas.

• There is a maximum interval of two hours between VMS pings; such a time gap creates uncertainty between interpolated vessel tracks and actual vessel position between VMS records.

Offshore Results:

The results showed that 100.3 km² (38.73%) of offshore reefs were estimated to be in 'not good' condition and 87.4 km² (33.74%) in 'good' condition. 71.8 km² (27.71%) of offshore reef was unassessed and therefore classed as unknown. There is low confidence in this assessment.

For full details of the assessment method, data sources, and associated caveats please see the BH3a method for the Extent of Physical Disturbance to Benthic Habitats (Matear et al., 2023).

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
PD01: Wind, wave and tidal power (including infrastructure)	Ongoing and likely to be in the future	Medium (M)

PF15: Modification of coastline, estuary and coastal conditions for 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)
PA17: Agricultural activities generating pollution to surface or ground waters (including marine)	Ongoing and likely to be in the future	Medium (M)
PJ01: Temperature changes and extremes due to climate change	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	High (H)
PG03: Marine fish and shellfish harvesting activities causing physical loss and disturbance of seafloor habitats	Ongoing and likely to be in the future	High (H)
PI02: Other invasive alien species (other than species of Union concern)	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)
PJ13: Change of species distribution (natural newcomers) due to climate change	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)

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	Both inside and outside 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
MA10: Reduce/eliminate point or diffuse source pollution to surface or ground waters (including marine) from agricultural activities	High (H)
MC03: Adapt/manage renewable energy installation, facilities and operation (excl. hydropower and abstraction activities)	Medium (M)
MF02: Habitat restoration of areas impacted by residential, commercial, industrial and recreational infrastructure, operations and activities	Medium (M)
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).	Medium (M)
MF10: Other measures related to residential, commercial, industrial and recreational infrastructures, operations and activities	High (H)
MG01: Management of professional/commercial fishing, shellfish and seaweed harvesting (incl. restoration of habitats)	High (H)
MK01: Reduce impact of mixed source pollution	High (H)

MG09: Other measures to reduce impacts from aquaculture infrastructures and operation	Medium (M)
MI03: Management, control or eradication of other invasive alien species	Medium (M)
MJ01: Implement climate change mitigation measures	Medium (M)
MG05: Reduce bycatch and incidental killing of non-target species	Medium (M)
MH03: Reduce impact of other specific human activities	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	Overall stable
bi) Area	Negative - decreasing <=1% (one percent or less) per year on average
ci) Structure and functions	Negative - slight/moderate deterioration

9.1b Future prospects of parameters

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

9.2 Additional information

No additional information

10. Conclusions

10.1 Range	Unknown (XX)
10.2 Area	Unfavourable-inadequate (U1)

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	Deteriorating

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	
b) Maximum	
c) Best single value	1,295.47
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	Decreasing
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

The total extent of Annex I Reef habitat for which features have been designated (Grades A-C) in Welsh offshore SACs (offshore waters only) is 0 km².

The combined (inshore and offshore) extent of Annex I Reef habitat for which features have been designated (Grades A-C) in Welsh waters is 1295.47 km2, of which 9.04 km2 is biogenic and 1286.43 km2 is rocky reef.

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

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Main pressures

7.2 Sources of information

No sources of information

14. Explanatory Notes

Field label	Note
2.1: Year or period	Development of three map layers, one intertidal and one subtidal, used a variety of data sources. In summary, intertidal reef was identified primarily from reef biotopes using CCW's Phase I intertidal mapping survey Wyn et al. (2006) including updates (Grant, 2024a) Subtidal reef areas were identified from a variety of sources, including JNCC, BGS and NRW mapping work (Grant, 2024b). Offshore reef areas were provided by the JNCC.
4.1: Surface area	Combined inshore and offshore value: 3,411 km2 Rocky = 3389 km2 (99.4%) Biogenic = 22 km2 (0.6%) Inshore 3152 km2 (92.4% of total Reef in Wales) Rocky = 3130 km2 (99.3%) Biogenic = 22 km2 (0.7%) Offshore 259 km2 (7.6% of total Reef in Wales) Rocky = 259 km2 (100%) Biogenic = 0 km2 (0%) Inshore reefs form the largest reef component in Wales representing 92% of the habitat. Inshore surface area was calculated using map layers developed and improved over the last twenty years by CCW/NRW and JNCC. Inshore reef comprises intertidal and subtidal reef layers: intertidal reef, which makes up about 2% of Welsh reef, was mapped using reef biotopes identified within CCW's Phase I intertidal mapping survey data outputs Wyn et al. (2006), which has included periodic localised updates (e.g. Egerton et al., 2010) to capture losses and gains identified during surveys, casework and analysis of datasets and maps of abutting/encroaching habitat, as part of country-level reporting e.g. Article 7 and Regulation 9a (Grant, 2024a). Inshore subtidal reef comprises over 90% of Wales' reef habitat and has been identified primarily from biological and

	acoustic surveys and analysis of third-party maps and historic data sources including JNCC, BGS, Admiralty and NRW mapping work (Grant, 2024b). Offshore reefs areas were provided by the JNCC and similarly have been developed over decades of compiling survey and third-party data from a variety of organisations.
5.2: Surface area	Combined inshore and offshore value: 3,411 km2 Rocky = 3389 km2 (99.4%) Biogenic = 22 km2 (0.6%) Inshore 3152 km2 (92.4% of total Reef in Wales) Rocky = 3130 km2 (99.3%) Biogenic = 22 km2 (0.7%) Offshore 259 km2 (7.6% of total Reef in Wales) Rocky = 259 km2 (100%) Biogenic = 0 km2 (0%) Inshore reefs form the largest reef component in Wales representing 92% of the habitat. Inshore surface area was calculated using map layers developed and improved over the last twenty years by CCW/NRW and JNCC. Inshore reef comprises intertidal and subtidal reef layers: intertidal reef, which makes up about 2% of Welsh reef, was mapped using reef biotopes identified within CCW's Phase I intertidal mapping survey data outputs Wyn et al. (2006), which has included periodic localised updates (e.g. Egerton et al., 2010) to capture losses and gains identified during surveys, casework and analysis of datasets and maps of abutting/encroaching habitat, as part of country-level reporting e.g. Article 7 and Regulation 9a (Grant, 2024a). Inshore subtidal reef comprises over 90% of Wales' reef habitat and has been identified primarily from biological and acoustic surveys and analysis of third-party maps and historic data sources including JNCC, BGS, Admiralty and NRW mapping work (Grant, 2024b). There have been some on-going small intertidal losses of

reef due to development and coastal protection (NRW. 2019).

Whilst the majority of subtidal reef has remained stable (97% rocky reef), biogenic reef which makes up 7% of inshore subtidal reef has reduced in extent over recent years. Specifically, Modiolus reefs have suffered a 61% reduction since 2005, much of which (50%) occurred between 2015 and 2024 (NRW. In Prep 2025a). The reasons for the decline in Modiolus reefs are currently under investigation through the Nature Networks programme of work.

Reef area values include habitat of varying confidence from confirmed definite reef, where survey data has confirmed its presence, to lower confidence probable or possible reef derived from acoustic data or historic sources. It should be noted the reef layers do not account for fluctuations in sediment heights and exposure levels and the corresponding gains or losses to reef habitat.

We have little or no evidence of anthropogenic habitat loss outside of the UK National Site Network (previously Natura 2000 sites), other than that recorded during the permitting and licensing of developments. Therefore, habitat losses or gains are not easily quantified from sources including sea defence construction and maintenance, emergency works to travel infrastructure or developments outside of the Sites Network.

Offshore reefs areas comprise almost 8% of the total reef habitat in Wales. Offshore maps were provided by the JNCC and similarly have been developed over decades of compiling survey and third-part data from a variety of organisations. Offshore area calculations were therefore derived from JNCC supplied data.

Note, a 40km2 area of seabed within JNCC's offshore reef GIS layer, was erroneously classed as low confidence

	Modiolus modiolus 'possible reef ' based on historic maps and data. Following discussions with the JNCC and review of the relevant survey reports, these large offshore areas were reclassified as rocky reef. The most recent surveys to cover these areas were in 2005 & 2010, these confirmed the presence of small patches of offshore modiolus reefs north and northwest of Anglesey, however, most of the surrounding areas, were not biogenic reef (Rees, 2005; Blyth-Skyrme et al., 2008; Ramsay et al., 2022). These small patches of offshore modiolus reef are unprotected from fishing activities and probably subject to similar pressures as the North Llyn Modiolus reefs so might well be in a similar declining state. At present we do not have an area value for these possible offshore reefs, and this has been highlighted as an evidence gap and barrier to understanding the full status of modiolus biogenic reef in Wales.
5.7: Short-term trend; Magnitude	This value represents the combined value for inshore and offshore biogenic and Rocky reef. Inshore: The greatest recorded loss of reef habitat is within the inshore biogenic reef, specifically the North Llyn Modiolus biogenic reef. This reef is our best studied biogenic reef and has suffered 61% reduction in extent since 2005, much of which (50%) occurred between 2015 and 2024 (NRW. 2024; NRW. In Prep 2025a). Assuming a consistent rate of loss since 2005, this represents 3.4% loss per year (NRW. In Prep 2025a). However, in terms of area the North Llyn Modiolus reefs represent less than 0.05% of Wales' total reef habitat. As this is a well-studied and confirmed decline in reef area, and it is likely to continue in the future, the overall assessment for short term trend in surface area was entered as decreasing. Offshore: At the time of last survey (2005 & 2009-2010), there were small areas of offshore modiolus reefs north and northwest of Anglesey (Rees, 2005; Blyth-Skyrme et al., 2008 Ramsay et al., 2022). These areas are unprotected from fishing activities and probably subject to similar

	environmental pressures as the North Llyn Modiolus reefs. At present we do not have an area value for these possible offshore reefs, and this has been highlighted as an evidence gap and barrier to understanding the full status of modiolus biogenic reef in Wales.
5.14: Change and reason for change in surface area	The long-term trend covers the last 30 years. In this time there have been some losses from intertidal coastal defence work within (illegal) and outside of SACs. These are small and localised occurrences. Some changes in calculated subtidal inshore surface area were derived from survey work (e.g. Cardigan Bay and Pembrokeshire) as a result of ongoing evidence collecting to inform SAC management and applications for renewable power installations (e.g. Lough et al., 2017). Whilst the majority of subtidal reef has remained stable (97% rocky reef), biogenic reef which makes up 7% of inshore subtidal reef has reduced in extent over recent years. Specifically, Modiolus reefs have suffered a 61% reduction since 2005, much of which (50%) occurred between 2015 and 2024 (NRW. In Prep 2025a). The reasons for the decline in Modiolus reefs are currently under investigation through the Nature Networks programme of work. Offshore subtidal biogenic reef north and northwest of Anglesey is currently unknown in terms of extent or status. However, it is subject to similar environmental conditions and climate change impacts as the North Llyn modiolus bed, in additional to being unprotected from benthic fishing gears. The combination of potential threats suggests it is likely to have reduced in extent since last survey, in 2009-2010 (Rees, 2005; Ramsay et al., 2022).
6.1: Condition of habitat	a) Area in good condition Combined Good: 1300.7 Km2 Inshore: 1213.3 Km2 (biogenic = 6.2 Km2; Rocky = 1207.1

Km2)

Offshore – 87.4 Km2 (biogenic = 0 Km2; Rocky = 87.4 Km2)

b) Area in not-good condition

Combined Not Good: 1082.5 Km2

Inshore: 982.2 Km2 (biogenic = 12.8 Km2; Rocky = 969.4 Km2)

Offshore: 100.3 Km2 (biogenic = 0 Km2; Rocky = 100.3 Km2)

c) Area where condition is not known

Combined Unknown: 1020.5 Km2

Inshore: 948.7 Km2 (biogenic = 3.0 Km2; Rocky = 945.7 Km2)

Offshore – 71.8 Km2 (biogenic = 0 Km2; Rocky = 71.8 Km2)

Inshore: The area in good/not good/unknown condition for structure and function was assessed using collated available evidence and conclusions from specific data analyses which were spatially and ecologically relevant to Welsh Reefs. Evidence included SAC monitoring data, reefs indicative SAC condition assessments and data from intersecting Water Framework Directive (WFD) waterbody classifications (Jackson-Bué et al., In Prep. 2025).

The most recent SAC condition assessments in 2024 used a new assessment process, where sampling locations and sub-features were assessed against various indicators and targets. Each indicator was assigned primary, secondary or tertiary weighting to reflect their relative importance to the

feature. The overall SAC feature was classified favourable or unfavourable based on the combinations of indicators that failed their targets i.e. the feature failed if one primary indicator failed, or if two secondary indicators or three tertiary indicators failed their targets.

In the current reporting round this new approach was applied to features both inside and outside of SACs where information was available. Sub-features and sampling locations represented the unit of assessment, rather than SACs, and these were assessed against multiple indicators and were classified as 'Not Good' where one primary indicator failed, or if two secondary, or three tertiary indicators failed their targets.

In previous SAC condition assessments, a failure of any SAC indicator resulted in that feature being classed as unfavourable ('one out - all out'). When this method was applied to individual sampling locations and sub-features for Article 17 reporting, larger areas were classed as 'Not Good', especially where the assessment relied heavily upon WFD water quality data, which in the 2024 condition assessment methods was often given secondary weighting as an indicator.

As a result of this methodological change, larger areas of feature in the current round were classed as 'Good' compared to the previous round. This difference is unlikely to be due to improvements in habitat condition.

Note: Waterbody boundaries do not reflect coastal processes or hydrography. For this reason, the WFD results from a 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 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.

Inshore reef condition assessment methods:

Inshore reef was deemed to be 'Not-Good' where:

• Inside SACs specific sub-features or areas of reef failed to meet their targets/indicators in the most recent condition assessment. Where this was a well-mapped discrete polygon feature such as Modiolus reefs, relevant polygons in the GIS were classed as not good. Where the sub-feature/area of reef was not well mapped or less defined, the intersecting WFD waterbody was used as the unit of failure, and all reef polygons within were classed as not-good.

• Inside and outside SACs where two or more secondary WFD elements, or three or more tertiary elements were classified as less than 'Good' during the most recent WFD interim classification, all reef polygons within the failing waterbodies were classed as not-good.

• Inside and outside SACs the BH3a Indicator - Disturbance to Benthic Habitats: Fisheries with mobile bottom-contacting gears (Matear et al., 2023) was used to select and classify areas of reef as not-good, where the indicator result was moderate or high (total of 228.6 km2, which is 7.3% of the total area of the inshore reef feature). See BH3 caveats in offshore methods (section 6.8).

• Inside and outside SACs the Welsh Government Scallop fishing vessel activity 2012 to 2022 GIS layer was used to identify areas of reef where scallop fishing was most likely to occur. These were defined as 0.01 degree grid cells where 500 or more pings were recorded within the dataset. Reef polygons within such grid cells (total of 74.1km2,

which is 2.4% of the total area of the inshore reef feature) were classed as not good. See scallop fishing data caveats in section 6.8.

Levels of litter have not been used in this assessment as there is little spatial evidence on which to base an assessment. Welsh Government (2020) states 'marine plastic pollution is unlikely to pose a high risk to marine protected species and habitats in Wales at concentrations of plastic that can be considered environmentally realistic. While studies suggest some potential effects on habitat functioning, the decline of habitats due to plastic pollution is not evidenced, however, it does pose an additional cumulative anthropogenic pressure and gradual decline in habitats is difficult to attribute to a particular single pressure".

Data Analysis Contributing to SAC Condition Assessments:

Where monitoring surveys collected multivariate data, analysis employed multivariate statistics in conjunction with consideration of natural and anthropogenic influences that may explain observed changes. Examples include analysis of intertidal and subtidal reef benthic community records (e.g. quadrats with species or morphology counts) as well as reef fish communities. Where appropriate, consideration of univariate measures were also assessed (e.g. single species abundance changes).

The spatial extent of NRW's reef monitoring is limited and unless it happens to be in an area of localised impact it tends to provide an indication of changes due to wider environmental variables acting at the estuary, bay or wider sea level. Some example projects from across Wales and which are referred to in the evidence sources section include:

- Intertidal biogenic reef monitoring of Sabellaria alveolata and Mytilus edulis,

- Subtidal biogenic reef monitoring using drop down video and side-scan of Modiolus modiolus

- Single species monitoring of Mediterranean-Atlantic species e.g. Parazoanthus axinellae, Eunicella verrucosa, Caryophyllia smithii cup corals.

- Reef fish- fish community monitoring,

- Broadscale habitat monitoring (biotopes)

- Monitoring of algal and faunal communities of intertidal and subtidal reef (quadrats, multivariate)

- Monitoring of algal and faunal communities of specialist reef habitats incl. rockpools, overhangs and gullies,

- Surveillance of physical parameters e.g. temperature

- Surveillance of marine activities e.g. commercial potting and recreational diver activity.

Offshore: Assessment of condition for offshore habitat used the BH3a Indicator - Disturbance to Benthic Habitats: Fisheries with mobile bottom-contacting gears (Matear et al., 2023).

Offshore methodology - BH3a

The indicator Disturbance to Benthic Habitats: Fisheries with mobile bottom-contacting gears (BH3a; Matear et al., 2023) was used to assess the area of the UK offshore (beyond 12nm) Annex I Reef. The indicator spatially combines different levels of fishing intensity pressure and habitat sensitivity data to estimate the distribution and degree of seafloor disturbance across the UK. Sensitivity of species and habitats to specific pressures is categorised as a combination of their ability to tolerate or withstand a given

pressure (resistance), and their ability to recover structure and function (resilience). Potential disturbance estimates were calculated from aggregated 2016 to 2020 fishing pressure data (ICES, 2021a). BH3 layers were intersected with Habitats Regulations feature layers for Wales.

Disturbance categories were calculated for the aggregated pressure assessment periods (2016 - 2020). The disturbance categories are grouped as followed for summary; Zero: No reported VMS data or 0 SAR values; Low: Categories 1-4; Moderate: Categories 5-7; High: Categories 8 and 9; and Unassessed Disturbance: Areas where SAR values greater than 0 were reported but disturbance could not be assessed due to an absence of sensitivity information. Disturbance categories Zero and Low (0-4) are used to report Section 6.1a 'area in good condition' and disturbance categories Moderate and High (5-9) are used to report 6.1b 'area in not good condition'.

Data sources and caveats

For a full list of caveats associated with fishing pressure data provided by ICES, please refer to ICES (2021a). Key caveats to consider when interpreting indicator results in this report are as follows:

• Fishing pressure was assumed to be homogeneous in distribution throughout each ICES c-square. This assumption can result in an overestimate of the extent of fishing pressure and an underestimate of intensity of fishing pressure within a c-square. It should be noted, this assumption is due to the restrictions on national fishing datasets that contributed to the ICES data call.

• Conversely, distribution and / or intensity of fishing pressure may be underestimated due to no VMS data for vessels less than 12m in length. Such vessels predominantly operate in coastal areas.

	• There is a maximum interval of two hours between VMS pings; such a time gap creates uncertainty between interpolated vessel tracks and actual vessel position between VMS records. • While BH3a and Welsh Government's fishing data analysis have been filtered with the assumption that fishing activity occurs between 1 and 4 knots, it is possible that other activities such as steaming and transiting may occur within this speed range. • The resolution of grid cells can lead to an over-estimation of assumed fishing effort. Habitat data for the BH3a indicator was obtained from an OSPAR scale combined habitat map produced by JNCC (Castle et al., 2021; JNCC. 2025). Consequently, there may be discrepancies with the habitat information used for the BH3a indicator, and the ranges and extent of Habitats Regulations feature layers. Additionally, in instances where pressure data intersected areas without sensitivity information, due to a lack of EUNIS habitat data or sensitivity assessment for the habitat in the QSR 2023 assessment, outputs were classified as 'Unassessed Disturbance' (unknown condition).
6.4: Short-term trend of habitat area in good condition; Direction	Values for comparison: 2025 Inshore values: Good = 1213.3 Km2 Not Good = 982.2 km2 2019 values: Good = 537.70 Km2, Not Good = 932.33 km2 2013 values: Good = 29.41 Km2, Not Good = 3006.24 km2 The change in good area value compared to 2019 is attributed to changes in assessment and mapping methods (see section 6.1 for an explanation).

	During the trend period, a greater number of habitats are being investigated as 'in decline' and WFD waterbodies classified as moderate or poor. The short-term trend based on information from the SAC condition assessments (Jackson-Bué et al., In Prep. 2025) and most recent WFD classification (2024 cycle 3 interim classification) suggests a decreasing short-term trend. However, no meaningful comparison was possible, of the extent of Reef in good condition, between 2019 and present, as the two reports covered different areas. In the current reporting round, calculations of good and not good habitat included both inshore and offshore reef, whereas in previous reports, only the inshore reef was included. Therefore, short-term trend is reported as unknown.
6.8: Additional information	Inshore Results: Welsh Government Scallop fishing vessel activity 2012 to 2022 methods from the Datamap Wales website (Datamap Wales 2022): This layer represents the total scallop fishing vessel activity over the 2012 to 2022 scallop fishing seasons. The scallop fishing season runs from 1st November to 30th April. Since 2012, vessels fishing for scallops in the Welsh scallop fishery have been required to install a Vessel Monitoring System (VMS). The VMS records the location, speed, and heading of the vessel. Each record is referred to as a 'ping'. Welsh Government have filtered the data to remove any 'pings" where vessels are not fishing. Welsh Government have assumed that vessels are fishing when travelling between 1 and 4 knots, and that no fishing occurs within 1km of ports. Welsh Government have aggregated the filtered data to show the number of pings per 0.01 degree grid cell. In order to protect the anonymity of fishers, no data is shown for cells containing data from less than 3 vessels.

	Key caveats and considerations when interpreting Welsh Government Scallop fishing vessel activity data: • Vessels are assumed as fishing when travelling between 1 and 4 knots. This can lead to an overestimation in fishing activity as it is possible the boat is not fishing and traveling less than 4 knots. • Scallop fishing activity is assumed to be homogeneous in distribution throughout 0.01 degree cell. This assumption can result in an overestimate of the extent of fishing pressure and an underestimate of intensity of fishing pressure within a cell. It should be noted, this assumption is due to the Welsh Government's spatial display restrictions of VMS based fishing activity dataset. • There is a maximum interval of 10 minutes between VMS pings. Offshore Results: The results showed that 100.3 km² (38.73%) of offshore reefs were estimated to be in 'not good' condition and 87.4 km² (33.74%) in 'good' condition. 71.8 km² (27.71%) of offshore reef was unassessed and therefore classed as unknown. There is low confidence in this assessment. For full details of the assessment method, data sources, and associated caveats please see the BH3a method for the Extent of Physical Disturbance to Benthic Habitats (Matear et al., 2023).
7.1: Characterisation of pressures	PG01: Marine fish and shellfish harvesting causing reduction of species/prey populations and disturbance of species (professional). Affecting Inshore (H) & Offshore (H). Ongoing and likely to be in the future – High.

Fishing activities, particularly the use of demersal towed gears, pose a significant risk to stony and biogenic reef habitats through physical disturbance and abrasion to the biological communities (JNCC & NE, 2011; Walmsley et al., 2015).

Inshore:

BH3a VMS fishing activity analysis (2016 and 2020) indicates assumed fishing activity overlaps with 67% of inshore reef and of this, 7% was classified as medium or high intensity assumed fishing activity (ICES, 2021; Matear, 2023). Welsh Government's VMS data analysis (2012-2022) for assumed scallop fishing activity indicates a 2.4% overlap of high intensity assumed fishing activity with inshore reef (Welsh Government 2022).

Using JNCC's offshore assessment methods the ranking of this pressure is considered high due to the sensitivity of this habitat to the effects of demersal trawling and fishing causing physical disturbance and physical loss, and the spatial overlap of >25% identified from human activity layers. (see Additional Information - offshore assessment methods). Whilst it is acknowledged the inshore fleet of under 12m vessels are the largest fishing sector in inshore Wales (Pantin et al., 2015), a current lack of spatial data to evidence where this activity overlaps with reef habitat, means this assessment relies on the aggregated VMS fishing data for vessels over 12m in length provided by ICES/OSPAR (ICES, 2021; Matear, 2023). Inshore VMS data is available from 2022 and should be analysed for the next reporting round.

In Wales the largest fishing sector is the inshore potting fleet, targeting crab, lobster and whelk (Pantin et al., 2015). While shellfish potting is generally considered a lower-impact activity compared to demersal mobile gears, the deployment and recovery of pots can also cause damage. Where pots are fixed in strings, the retrieval of pots, or

incidences of rough weather, could lead to ropes, pots and anchors dragging over or entangling reef structures, potentially causing physical damage or abrasion to the biological communities (MacDonald et al., 1996; Roberts et al., 2010; JNCC & NE, 2011, Gall, 2020). Additionally, during spring tides, strong wind and large waves may cause unintentional movement of pots and any associated reef abrasion could be increased (Eno et al., 2001; Sørensen et al., 2015; Stephenson et al., 2015).

Assessing Welsh Fishing Activities (AWFA) indicate that impacts from Welsh pots or associated weights or anchors, making contact with the reef habitat could cause damage to the biological communities living on the reef (AWFA, 2022a, b, c & d). Additionally, AWFA (2022d) states impacts from pots, weights or anchors could damage the biogenic substrate of mussel beds such as Modiolus reef. Within the intertidal, bait collection (boulder turning) occurs, often in sensitive sheltered and tide-swept habitats. Commercial intertidal shell fisheries are active in some areas and include winkle picking (with associated boulder turning and ecosystem effects). Intertidal boulder surveys in the Menai Strait suggest a continued disturbance and damage to the flora and fauna (Moore & Brazier, 2013).

Note, the change in this pressure from Medium to High for inshore areas since 2019 was due to a different and more objective assessment method. JNCC provided the assessment method for offshore reef habitat, and this was also adopted for inshore areas to be consistent. The pressure was assessed as high where >25% of the feature overlapped the best available fishing activity data.

Offshore:

Fishing pressures resulting in the removal of target and non-target species refer to any damage, loss or removal of species defined as a designated feature, or species integral to the integrity of a designated feature (for example key

structural or influential species). Biogenic reefs formed by species such as Sabellaria spinulosa may be impacted in this way.

72% of offshore reef spatially overlapped with low, medium of high intensity fishing activity, assessed between 2016 and 2020, and of this value, 39% overlapped medium or high intensity fishing activity (ICES, 2021; Matear, 2023).

The ranking of this pressure is considered high due to the sensitivity of this habitat to the effects of demersal trawling and fishing causing physical disturbance and physical loss, and the spatial overlap of >25% identified from human activity layers. Trends reported until 2030 are uncertain, however there has been an increase in fisheries activities in the Celtic Seas and Greater North Sea (OSPAR, 2023b).

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

Affecting Inshore (H) & Offshore (H). Ongoing and likely to be in the future – High.

Inshore:

BH3a VMS fishing activity analysis (2016 and 2020) indicates assumed fishing activity overlaps with 67% of inshore reef and of this, 7% was classified as medium or high intensity assumed fishing activity (ICES, 2021; Matear, 2023). Welsh Government's VMS data analysis (2012-2022) for assumed scallop fishing activity indicates a 2.4% overlap of high intensity assumed fishing activity with inshore reef (Welsh Government 2022).

Using JNCC's offshore assessment methods the ranking of this pressure is considered high due to the sensitivity of this habitat to the effects of demersal trawling and fishing causing physical disturbance and physical loss, and the spatial overlap of >25% identified from human activity

layers. (see Additional Information - offshore assessment methods). Whilst it is acknowledged the inshore fleet of under 12m vessels are the largest fishing sector in inshore Wales (Pantin et al., 2015), lack of spatial data to evidence where this activity overlaps with reef habitat, means this assessment relies on the aggregated VMS fishing data for vessels over 12m in length provided by ICES/OSPAR (ICES, 2021; Matear, 2023). Inshore VMS data is available from 2022 and should be analysed for the next reporting round.

In Wales the largest fishing sector is the inshore potting fleet, targeting crab, lobster and whelk (Pantin et al., 2015). While shellfish potting is generally considered a lower-impact activity compared to demersal mobile gears, the deployment and recovery of pots can also cause damage. Where pots are fixed in strings, the retrieval of pots, or incidences of rough weather, could lead to ropes, pots and anchors dragging over or entangling reef structures, potentially causing physical damage or abrasion to the reef (MacDonald et al., 1996; Roberts et al., 2010; JNCC & NE, 2011, Gall, 2020). Additionally, during spring tides, strong wind and large waves may cause unintentional movement of pots and any associated reef abrasion could be increased (Eno et al., 2001; Sørensen et al., 2015; Stephenson et al., 2015).

Assessing Welsh Fishing Activities (AWFA) indicate that impacts from pots or associated weights or anchors, making contact with the reef habitat could cause damage to the biological communities living on the reef (AWFA, 2022a, b, c & d). Additionally, AWFA (2022d) states impacts from pots, weights or anchors could damage the biogenic substrate of mussel beds such as Modiolus reef.

Within the intertidal, bait collection (boulder turning) occurs, often in sensitive sheltered and tide-swept habitats. Intertidal shell fisheries are active in some areas and include winkle picking (with associated boulder turning and

ecosystem effects) and mussel collection. Intertidal boulder surveys in the Menai Strait suggest a continued disturbance and damage to the flora and fauna (Moore & Brazier, 2013).

Note, the change in this pressure from Medium to High for inshore areas since 2019 was due to a different and more objective assessment method. JNCC provided the assessment method for offshore reef habitat, and this was also adopted for inshore areas to be consistent. The pressure was assessed as high where >25% of the feature overlapped the best available fishing activity data.

Offshore:

72% of Welsh offshore reef spatially overlapped with low, medium of high intensity fishing activity, assessed between 2016 and 2020, and of this value, 39% overlapped medium or high intensity fishing activity (ICES, 2021a; ICES, 2021b; Matear, 2023).

The ranking of this pressure is considered high due to the sensitivity of this habitat to the effects of demersal trawling and fishing causing physical disturbance and physical loss, and the spatial overlap of >25% identified from human activity layers. Trends reported until 2030 are uncertain, however there has been an increase in fisheries activities in the Celtic Seas and Greater North Sea (OSPAR, 2023b).

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

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

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

Inshore only: Ongoing and likely to be in the future;

Medium.

There are several sources of pollution to the marine environment that are both difficult to quantify and apportion. Open coast areas are relatively unpolluted, but many of the inshore reefs have raised levels of nutrients and contaminants, especially those closer to estuaries or urban areas. In total 44% of Welsh inshore reef overlapped with WFD waterbodies classified less than 'Good' overall, in the most recent WFD classification (WFD Interim Classification, 2024). With such a large area of inshore reef (>25%) overlapping less than good waterbodies, the mixed source marine pollution pressure should be assessed as High. However, the sensitivity of reef habitat to the suite of determinants assessed by the WFD is not well understood (Jackson-Bué et al., In Prep 2025), therefore this pressure is downgraded to Medium.

In total 31% of Welsh inshore reef was partly or wholly within WFD waterbodies classified less than good for contaminants (chemicals) in the most recent WFD classification (WFD Interim Classification, 2024). With such a large area of inshore reef (>25%) overlapping failing waterbodies, the residential, commercial and industrial activities and structures generating marine pollution pressure has been assessed as High. However, the sensitivity of reef habitat to the suite of determinants assessed by the WFD is not well understood (Jackson-Bué et al., In Prep 2025), therefore this pressure is downgraded to Medium.

Waterbody failures that impacted SACs due to contaminants according to the most recent WFD cycle 3 interim classification included: Anglesey North, Foryd Bay, Conwy Bay and Conwy, Cardigan Bay North, Mawddach, Cardigan Bay Central, Skomer (sediments only), and Milford Haven Inner (Jackson-Bué et al., In Prep 2025). These failed for one or more of the following contaminants: PBDE, mercury, PAH, PCBs and cypermethrin. Historically,

the main source of PBDE is as flame retardants in a variety of materials (Viñas et al., 2022). Mercury has been used in many industries, but today the primary sources are burning of coal and artisan mining for mercury (Larsen and Hjermann, 2022). PAHs can be produced through natural processes, but also arise from anthropogenic sources, for example during combustion of fossil fuels and organic material (Webster and Fryer, 2022). Cypermethrin is an insecticide used for plant protection in crops, in forestry, gardens, homes and businesses. It is also used in veterinary medicine to control pests in livestock and pets (Environment Agency. 2019). The application of cypermethrin has been restricted for some uses (sheep dipping and in forestry against the pine weevil).

In total 21% of inshore reef was partly or wholly within WFD waterbodies classified less than good for nutrients (DIN) in the most recent WFD classification (WFD Interim Classification, 2024). For this reason, the agricultural activities generating pollution to surface or ground waters (including marine) pressure was assessed as Medium. Waterbody failures that impacted SACs due to diffuse nutrients: The Milford Haven Inner and Outer waterbodies and the Teifi and Solfach Estuaries (Jackson-Bué et al., In Prep 2025). The largest input of nutrients was likely to be from diffuse sources associated with farm infrastructure and probable losses from agricultural land (Lock, 2021a; Lock, 2021b; Jopson, 2022; Jopson et al., 2025). Additionally, point source continuous sewage discharge from the water industry was confirmed as minor source of nutrients linked to the DIN failures (Haines and Edwards, 2016; Caprez, 2020; Lock, 2021a; Lock, 2021b).

Marine macro-pollution (e.g. plastic bags, lost fishing/ angling gear and other anthropogenically derived debris) is often found entangled in sessile reef biota. There is a small increasing trend in marine litter on UK beaches (Nelms, 2017; NARC, 2015, 2016 & 2022).

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 on animal communities and recommendations of any appropriate management action.

PJ01 Temperature changes and extremes due to climate change &

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

Affecting Inshore (M) & Offshore (M). Ongoing and likely to be in the future – Medium.

Inshore:

Biogenic Modiolus reefs in Wales are the most southern known on the west coast of the UK and are considered at great threat from climate change (NRW, In Prep. 2025a). MarESA's sensitivity assessment classified Modiolus resistance to increases in temperature due to global warming as 'none to low' with resilience rated as 'very low' and overall sensitivity as 'high' (NRW, In Prep. 2025a). The resilience of the Modiolus reef already appears compromised, evident by the recent reduction in extent and increased fragmented nature of the bed (NRW, 2024).

The effects of southern species, moving northwards is still unclear, but there are suggestions that the increase in grazers could reduce algal cover in the future, changing the

character of intertidal and shallow subtidal habitats (Hawkins et al., 2009).

Offshore:

The timing of these pressures are now considered ongoing now and in the future due to evidence to suggest temperature changes and extremes and changes in species distributions due to climate change is already occurring. Confidence in available evidence has increased from low to medium (Moore & Smale, 2020). Benthic habitats are predicted to face increased temperatures and frequency of heatwaves under climatic projections in the future. Offshore circalittoral rocks are thought to face a strong effect of increased temperatures in the future (OSPAR, 2023a). 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.

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

Affecting Inshore (M) & Offshore (L): Ongoing and likely to be in the future; Medium.

Inshore:

The trend until 2030 predicts an increase in renewable energy in the Celtic Seas. Further areas are expected to be leased for development in the Irish Sea (Crown Estate, 2023). Whilst current overlap with reef remains low in Welsh waters, associated impacts from windfarm cabling routes are more likely.

Development of tidal lagoons, marine wind and tidal turbines all require a degree of anchoring, and infrastructure that are likely to have a footprint on the Reef feature. Within MPAs, these will require a HRA

assessment, with appropriate mitigation if necessary. Recent plans for a tidal lagoon at Swansea have currently stalled, such that this is now a future threat rather than a pressure. Plans for tidal turbines with associated cables to Aberdaron in Bardsey Sound are at the planning stage.

Offshore:

The trend until 2030 predicts an increase in renewable energy in the Celtic Seas. Further areas are expected to be leased for development in the Irish Sea (Crown Estate, 2023). While overlap with reef remains low in Welsh waters, associated impacts from windfarm cabling are more likely.

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

Inshore only: Ongoing and likely to be in the future; Medium

Several recorded small losses of habitat are associated with the creation and maintenance of roads, paths and railways along the coast. 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). In many cases, these activities are illegal and remediation is being carried out to resolve the inappropriate development. Outside of SACs, there is no requirement for a HRA, such that these activities are not effectively regulated. The quantity 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).

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

Inshore only: Ongoing and likely to be in the future; Medium

Presence of invasive non-native species on reefs including Crepidula fornicata (Bohn, 2014), Magallana (Crassostrea) gigas, Didemnum vexillum and Sargassum muticum. Modification of habitat and associated community is observable in areas of high density. Milford Haven is a hot spot, with a high UK diversity of non-natives being present (Mieszkowska, 2011). The future threat from highly damaging species such as Didemnum vexillum is high.

PJ10 Change of habitat location, size, and / or quality due to climate change. Affecting Inshore (M) & Offshore (M). Only in the future - Medium.

PJ11 Desynchronisation of biological / ecological processes due to climate change. Affecting Inshore (M) & Offshore (M). Only in the future - Medium.

PJ12 Decline or extinction of related species (e.g. food source / prey, predator / parasite, symbiote, etc.) due to climate change. Affecting Inshore (M) & Offshore (M). Only in the future – Medium.

Inshore:

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.

For species such as Modiolus modiolus, as sea temperatures increase not only is there a potential mismatch in timing of spawning and food availability but there may also be a reduction in the quality and quantity of available food (NRW, In Prep. 2025a). Mytilid larvae have been shown to efficiently capture >70% picophytoplankton (Amit et al. 2023), however, larvae appear to select for nanoeukaryotes and avoid picoeukaryotes such as Synechococcus (Lindeque et al. 2015).

Offshore:

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

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

Inshore only: Ongoing and likely to be in the future; Low

The extent of effects of power station operation on Reefs 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 thermal impacts further from this source. The impacts of the Wylfa Newydd Project, if it goes ahead will be assessed through a HRA.

PG16: Modification of coastal conditions for marine aquaculture. Inshore only: Ongoing and likely to be in the future; Low

PG19: Marine aquaculture generating marine pollution. Inshore only. Only in future; Low.

PG23: Other activities related to aquaculture and extraction or cultivation of biological living resources not referred to above. Inshore only. Only in future; Low.

Intensive bottom culture of mussels is present in some areas (e.g. Menai Strait) and there is increasing interest in others (e.g. Burry Inlet and the Three Rivers system). Pressure and threat are low due to poor understanding and low confidence in the effects of such activities. Hand gathering is not considered a pressure, due to the low intensity. Boat operated dredging for mussel seed requires an HRA and has not occurred on reefs in the past. Movement of mussel close to reef could transfer non-natives but a code of good practice is conditioned within the HRA.

PF05: Sports, tourism and leisure activities.

Inshore only: Ongoing and likely to be in the future; Low

Recreational damage from trampling occurs on biogenic Sabellaria reefs throughout Wales. This is particularly evident near to easy access locations.

PH08: Other human intrusions and disturbance not mentioned above.

Inshore only: Ongoing and likely to be in the future; Low

Damage to pink sea fans has been recorded in the Skomer MCZ (Newman et al., 2017), which may be due to dragging anchors, angling, potting or diving.

PG13: Bycatch and incidental killing (due to fishing and hunting activities.

Inshore only: Ongoing and likely to be in the future; Low

Incidental killing from ghost fishing, including lost pots and nets and lost angling gear (line, hooks and weights) cause damage to Reef biota (see NARC 2015; 2016; 2022 Pembrokeshire Marine SAC, 2025).

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

Inshore only: Ongoing and likely to be in the future; Low

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).

Inshore only. Ongoing and likely to be in the future; Low.

Recent and historic navigational and development related dredging (Milford Haven) resulting in removal of subtidal reef, i.e. deepening and tidal flow alteration. Changes to siltation levels due to navigational dredging and land run off (estuaries, including Milford Haven).

PE02: Shipping lanes and ferry lanes transport operations.

Offshore only. Ongoing and likely to be in the future; Low.

The trend until 2030 is uncertain but shipping has remained stable in Celtic Seas (OSPAR, 2023b). Any gradual increase in this activity is unlikely to pose significant direct threat to reefs, however indirect threats such likelihood of future pollution incidents will increase.

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

Inshore only. Ongoing and likely to be in the future; Low

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 airborne pollutants are likely to be derived from other industries across Wales.

PJ03 Changes in precipitation regimes due to climate change. Affecting Inshore. Only in future; Low

PJ04 Sea-level rise due to climate change. Affecting Inshore. Only in future; Low

PJ06 Wave exposure changes due to climate change. Affecting Inshore. Only in future; Low

PJ07 Cyclones, storms, or tornados due to climate change. Affecting Inshore. Only in future; Low

PJ14: Other climate related changes in abiotic conditions. Affecting Inshore and Offshore. Only in future; Low

Changes in abiotic conditions, including temperature changes, and extreme weather events causing increased

run-off of nutrients and pollution, including siltation, that effects the biotic conditions. 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 are likely to act in combination, with and exacerbate, localised temperature changes associated with current (Pembrokeshire) and future power stations (Anglesey) due to power station cooling water.

Sea level rise projections for Wales to 2099 (~ 1 m increase) suggest intertidal reef will be highly vulnerable to sea level rise in the long terms (Oaten et al., 2021).

Oaten et al. (2021) assessed some intertidal reef biotopes as likely to be highly vulnerable to climate driven changes in wave exposure by 2049. In particular, the Menai Strait and Conwy Bay SAC was found to have the greatest extent of vulnerability biotopes, probably because the greatest relative change in wave exposure is projected for this part of North Wales (NRW. In Prep 2025b). Fucoids on sheltered marine shores were identified as being particularly vulnerable to changes in wave exposure (Oaten et al., 2021).

This suit of climate change driven changes were assessed as low and acting in the future. Timescales are predicted to be greater than two reporting cycles away and impacts are most likely to affect intertidal habitat, which represents 2% of total Welsh reef.

PG23 Other activities related to aquaculture and extraction or cultivation of biological living resources not referred to above.

Affecting Inshore. Only in future; Low

Seaweed aquaculture is in its infancy in Wales but is subject to HRA under marine licensable activities. Currently

	there is a single farm operating in west Wales, but there is growing interest in this industry (NRW. In Prep 2025b). Wild seaweed gathering is currently small-scale and mostly non-commercial or conducted by small local businesses, however this activity has the potential to increase in the future (NRW. In Prep 2025b).
7.3: Additional information	For Offshore Reefs, the pressure and threats and their rankings have not changed since 2019, however two climate change threats are now considered ongoing pressures. The OSPAR thematic assessment of benthic habitats (OSPAR, 2023a) highlights that benthic habitats are impacted by activities operating and/or interacting with the biotic and abiotic components of the seafloor. Factors such as the need for new renewables developments, continued oil exploration and new carbon capture storage all have the potential to affect benthic habitats. Key pressures include shipping, fish and shellfish harvesting, extraction of minerals, tourism and leisure, renewable energy, submarine cables, oil and gas, agriculture, aquaculture and climate change causing physical disturbance, physical loss, and alterations to biological communities. Reefs are exposed to marine pollution from oil and gas operations and spillages and release from shipping. Pollution is, therefore, covered under the relevant pressure/threat codes. Offshore method overview The following steps were taken to identify ongoing pressures of the highest importance in the offshore: - The human activities and associated pressures to which the habitat's communities were highly and moderately sensitive were identified (JNCC, 2022. Tillin et al 2010). - These human activities/pressures were matched to the Article 17 pressures list using the JNCC Pressures-Activities Database (JNCC, 2022).

- Spatial overlap between the habitat and human activities was identified using the UK offshore benthic monitoring options risk assessment results (JNCC, 2017). This overlap was sense checked against the most recent habitat extent and human activities layers.

- Article 17 pressures were marked as high importance (H) when a high or moderate sensitivity was identified AND there was an overlap of >25% with the habitat

- Article 17 pressures were marked as medium importance (M) when a high or moderate sensitivity was identified AND there was a 10-25% overlap with the habitat

- Expert judgement used the best available information to determine if future impacts identified in the previous reporting cycle had transitioned into ongoing impacts or past impacts in the current reporting cycle. No pressures were determined to be acting in the past only.

The following steps were taken to identify future pressures of the highest importance:

- Expert judgement used the best available information and trends identified in the Quality Status Report (OSPAR, 2023b) to predict the main human activities (Article 17 pressures) that are thought to have a future impact on the feature within the next two reporting cycles. Habitat sensitivity and spatial overlap were considered as they were for ongoing pressures with predicted future overlap considered where available.

Caveats for Offshore Reefs:

Caveats - Human activities data - The monitoring options for the UK benthic habitats risk assessment was completed in 2016 and so uses habitat and human activity data updated in that year (JNCC, 2017). The UK risk

assessment gave results for rocky reef and Sabellaria spinulosa habitats down to 200 m depth. Deep-sea reefs were not included in this assessment; however, the results were thought to be broadly representative of the UK offshore reef area.

Caveats - Habitat sensitivity - associated with the MarESA sensitivity information can be found in the Tyler-Walters, (2018) reports. - If sensitivity of the broadscale habitat is a range then the highest is taken. This results in the highest possible disturbance category being selected as a precautionary approach.

Caveats - Habitat map - The pressures section only considers the activities that occur over the known mapped area of the feature, as the full extent of the feature is uncertain.

Caveats – Future - The evidence used in relation to climate change has moderate confidence (Moore & Smale, 2020). The details of the proposed windfarms have not yet been confirmed.

Welsh Government Scallop fishing vessel activity 2012 to 2022.

Methods: This layer represents the total scallop fishing vessel activity over the 2012 to 2022 scallop fishing seasons. The scallop fishing season runs from 1st November to 30th April. Since 2012, vessels fishing for scallops in the Welsh scallop fishery have been required to install a Vessel Monitoring System (VMS). The VMS records the location, speed, and heading of the vessel. Each record is referred to as a 'ping'. Welsh Government have filtered the data to remove any 'pings” where vessels are not fishing. Welsh Government have assumed that vessels are fishing when travelling between 1 and 4 knots, and that no fishing occurs within 1km of ports. Welsh Government have aggregated the filtered data to show the

	number of pings per 0.01 degree grid cell. In order to protect the anonymity of fishers, no data is shown for cells containing data from less than 3 vessels.
8.1: Status of measures	Inshore: Some measure have been both identified and taken, but others are yet to be implemented. Offshore: There are currently no Welsh offshore MPAs within the UK's National Site Network, where Annex I Reef habitat is a designated feature (Grades A-C).
8.4: Response to the measures	MB0102 sensitivity matrix has L-H for sensitivity to the fishing pressures abrasion and physical loss for reef broad-scale habitats. MB0102 rResilience scores are, therefore, high to very low which ranges from full recovery within 2 years to negligible or prolonged recovery; at least 25 years to recover structure and function (Tillin et al., 2010).
8.5: List of main conservation measures	MG01: Management of professional/commercial fishing, shellfish and seaweed harvesting (incl. restoration of habitats). Affecting Inshore (H) & Offshore (H). High 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, Crab and lobster FMPs will

all be relevant for assessing and managing the interactions of fishing activities with Welsh reef habitat. 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 where 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, 2010a) and The Whelk Fishing Permit (Wales) Order 2021 (Welsh Government 2021a) are both assessed annually in terms of catch limits, minimum landing sizes and potential environmental impacts.

The Welsh Government has a clear and evidence led process for assessing the impacts from fisheries, including HRAs (where appropriate). Fishing activities that require a permit e.g. scalloping, whelk fishing, and mussel dredging are subject to the HRA process which looks at the impact pathways from the activity on the feature and the AWFA project is delivering evidenced based assessments on the impacts from fishing activities on protected features. Outside of protected areas, and for fisheries that are not subject to HRA, the habitats present and the intensity of fishing is less well understood. While it is not believed to occur, demersal mobile gear fishing can still occur on a number of designated reef features within some SACs. The Irish Sea and Celtic Sea and Western Channel FMPs will consider these interactions when they are implemented.

The Welsh Government's Welsh National Marine Plan identifies potential opportunities for development of shellfisheries across Wales. This is accompanied by appropriate safeguards within Protected Sites (HRA,

statutory Instruments), to protect the features, and the plan also contains a series of environmental policies that apply throughout Welsh seas that should ensure that all development is sustainable. Where Regulating and Several Orders are applied for, this also provides some safeguards to protect Annex I habitats 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.

Scallop fishing and beam trawling are prohibited from Skomer. NRW staff liaise with fisheries groups and individuals who are represented on the Skomer MCZ Advisory Committee, with a view to establishing a means to avoid fishing in areas where higher densities of Seafans are known to occur (Lock et al., 2022 & 2024). A voluntary code of practice established with commercial fishermen to prevent the use of monofilament tangle nets within 50 m of the coast of Skomer Island (Lock et al., 2022 & 2024). Combined these management initiatives aim to improve and maintain fish stocks and reduce impacts from fishing to marine species and habitats.

Impacts from offshore (outside 12nm) fishing, by non-Welsh boats, in Wales is poorly understood. Therefore, pressures relating to the offshore were assessed using the BH3 indicator (Matear et al., 2023) described in section 6.1 and 6.8.

This measure is ranked High, as the related pressure in section 7 is ranked High due to the sensitive nature of the reef habitat combined with the large extent potentially covered by fishing (Matear et al., 2023; Welsh Government. 2022).

MF10: Other measures related to residential, commercial, industrial and recreational infrastructures, operations and activities. Affecting Inshore (H). High

This measure covers 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.

MF06: Reduce/eliminate marine pollution from industrial, commercial, residential and recreational areas and activities (incl. contamination with litter). Affecting Inshore (H) & Offshore (H). High &

MK01: Reduce impact of mixed source pollution. Affecting Inshore (H) & Offshore (H). High &

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

Key measures which are in place to mitigate water quality related pressures 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; 2022) 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. Shared multi-agency pollution response plans to deal with major incidences are in place and are regularly updated.

MF08: Manage changes in hydrological and coastal systems and regimes for construction and development

(incl. restoration of habitats). Affecting Inshore (M). Medium

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 Pen Llŷn a'r Sarnau SAC has an objective to restore the 'Estuaries' feature where the structure and functions of the estuaries that have been damaged/degraded by the constraints of artificial structures such as flood banks. Reef in estuarine conditions is a small part of the reef feature, but it is under greater threat than Reef in other areas. 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 including sheltered intertidal reef 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) identify the most sustainable approach to managing the flood and coastal erosion risks to the coastline in the short, medium and long term.

MJ01: Implement climate change mitigation measures. Affecting Inshore (M) & Offshore (M). Medium.

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.

MF02: Habitat restoration of areas impacted by residential, commercial, industrial and recreational infrastructure,

operations and activities. Affecting Inshore (M). Medium

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, 2019).

MC03: Adapt/manage renewable energy installation, facilities and operation (excl. hydropower and abstraction activities). Affecting Inshore (M). Medium

Consents are required to develop renewable energy installations such as wind and tidal turbines, tidal lagoon and their associated cables. Over the past reporting period, for 1-100MW capacity projects, developers were required to gain approval from Marine Management Organisation (Section 36 Electricity Act). 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 Part 4 of the Marine and Coastal Access Act, 2009). The licence application is determined by NRW. Each application may require an Environmental Impact Assessment and Habitats Regulation Assessment (where within or adjacent to a Natura 2000 site). Based on evidence produced mitigation is agreed and implemented as appropriate. This generally reduces the impact of

developments. This measure relates to PD01 and was ranked as medium because a moderate area of reef could be impacted. From April 2019, the consenting requirements for marine energy generation in Wales changed, as requirements of the Wales Act are implemented.

MG05: Reduce bycatch and incidental killing of non-target species. Affecting Inshore (M) and Offshore (M). Medium

A voluntary code of practice established with commercial fishermen to prevent the use of monofilament tangle nets within 50 m of the coast of Skomer Island.

Legislation, management and investigation aims to improve and maintain fish stocks and reduce impact of fishing to marine species and habitats.

MH03: Reduce impact of other specific human activities. Medium

Conservation measures for protecting seafans (and other MCZ seabed features at Skomer Island) include a voluntary no anchoring code of conduct throughout the MCZ (other than two permitted areas in North and South Havens) and a conservation byelaw that states (among other things) no person shall 'kill, take, destroy, molest or disturb any animal or plant” in the MNR (under the MaCAA transitional arrangements, the byelaws still apply to the Skomer MCZ until a designating order is created). The byelaw does not interfere with 'any right of fishery”, so does not affect operations undertaken for commercial fisheries. To address the latter NRW staff liaise with fisheries groups and individuals who are represented on the MCZ Advisory Committee, with a view to establishing a means to avoid fishing in areas where higher densities of seafans are known to occur.

A voluntary code of practice established with commercial

fishermen to prevent the use of monofilament tangle nets within 50 m of the coast of Skomer Island.

A further and very important measure are weekend boat patrols, to encourage compliance and ensure that visitors are aware of the codes and byelaws.

MI03: Management, control or eradication of other invasive alien species. Affecting Inshore Medium &

MG09: Other measures to reduce impacts from aquaculture infrastructures and operation. Affecting Inshore (M). Medium

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 Ecological 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. This measure was upgraded from Low to Medium due to the recent spread of the slipper limpet Crepidula fornicata into the Menai Strait and Conwy Bay SAC. This highlights the need for improved biosecurity measures in Wales.
10.1: Range	10.1 Conclusion on Range reached because: (i) the short-term trend direction in Range surface area is stable; and (ii) the Favourable Reference Range is unknown.
10.2: Area	10.2. Conclusion on Area reached because: (i) the short-term trend direction in Area is decreasing by 1% per year or less; (ii) the Favourable Reference Area is unknown and iii) there has been no significant change in distribution pattern within range.
10.3: Specific structure and functions	10.3 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 unknown; and iii) expert opinion determines that there are no significant issues for this habitat. Short-term trend in area of habitat in good condition was assessed as 'unknown' because a combination of two confounding factors: 1. It was not possible to meaningfully compare trends

	between 2019 and the present due to differences in reporting between the two rounds, i.e. the current round calculations of good and not good habitat include both inshore and offshore reef, whereas in previous reports, only the inshore reef was assessed. Therefore, the two reports cover different areas. 2. There has been a decline in habitat in good condition, specifically relating to horse mussel (Modiolus modiolus) biogenic reefs, however, these represent a very small proportion of inshore and offshore Reef overall. Therefore, we have little data to suggest the majority of Reef is anything but stable except the decline in modiolus reef. Due to this uncertainty whether the short-term trend in area of habitat in good condition (6.4) should be reported as stable or decreasing, it was assessed as unknown and the conclusion was Unfavourable-inadequate.
10.4: Future prospects	10.4 Conclusion on Future prospects reached because: (i) the Future prospects for Range are unknown; (ii) the Future prospects for Area covered by habitat are poor; and (iii) the Future prospects for Structure and function are poor.
10.5: Overall assessment of Conservation Status	10.5 Overall assessment of Conservation Status is Unfavourable-inadequate because three of the conclusion conclusions are Unfavourable-inadequate and one is Unknown.
11.1: Surface area of the habitat type inside the pSCIs, SCIs and SACs network	Best single value= Combined: 1295.47 Km2 Inshore: 1295.47 Km2 (biogenic = 9.04 Km2; Rocky = 1286.43 Km2) Offshore – 0 Km2 (biogenic = 0 Km2; Rocky = 0 Km2) The combined (inshore and offshore) extent of Annex I Reef habitat for which features have been designated (Grades A-C) in Welsh waters is 1295.47 km2, of which 9.04 km2 is biogenic and 1286.43 km2 is rocky reef. Only SACs have been considered where reefs are a

	primary or secondary reason for site designation (Grade A, B or C).
11.4: Short-term trend of habitat area within the network; Direction	Feature that is in Protected Sites and in Good condition amounts to 348.04 km2. Differences in approach make a comparison with the 2019 data not possible. Differences that exist are most likely relate to the changes in waterbody status between reporting periods.
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.