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

2019-2024

Conservation status assessment for the species:

S1103 - Twaite shad

(*Alosa fallax*)

Wales

Cyfoeth Naturiol Cymru
Natural Resources Wales

JNCC

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Important note - Please read

- The information in this document represents the 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 species 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 species (section 12 National Site Network coverage for Annex II species).

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

Assessment Summary: Twaite shad

Distribution Map

Range Map

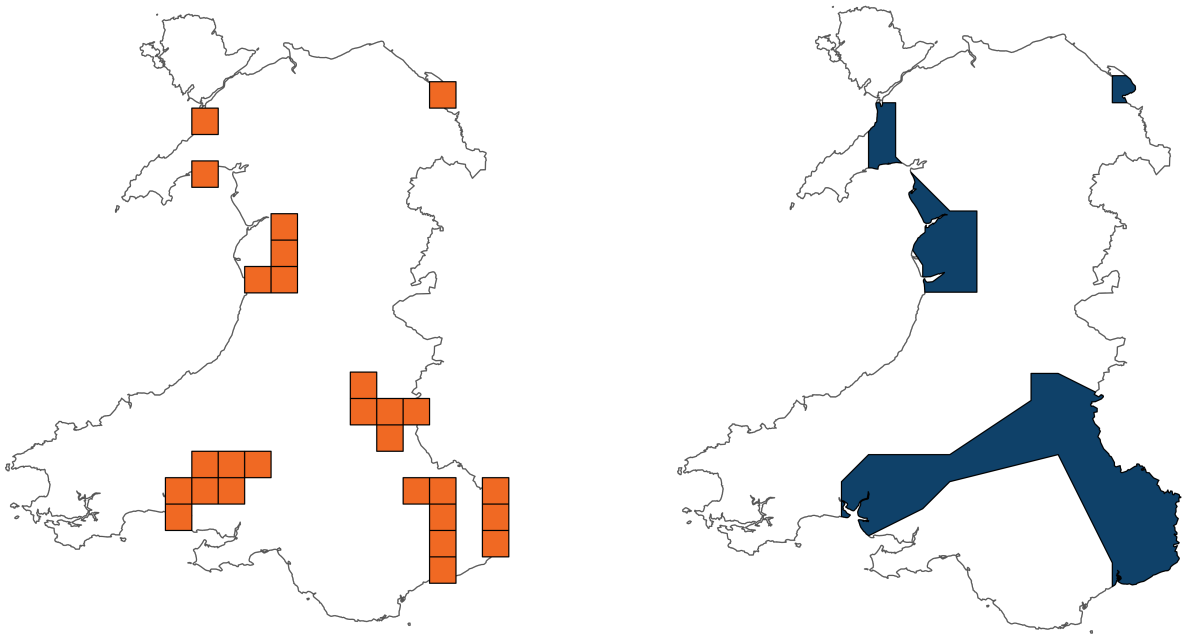

Figure 1: Wales distribution and range map for S1103 - Twaite shad (*Alosa fallax*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority. The 10km grid square distribution map is based on available species records within the current reporting period.

Table 1: Table summarising the conservation status for S1103 - Twaite shad (*Alosa fallax*). Overall conservation status for species is based on assessments of range, population, habitat for the species, and future prospects.

Overall Conservation Status (see section 11)

Unfavourable-bad (U2)

Breakdown of Overall Conservation Status

Range (see section 5)	**Favourable (FV)**
Population (see section 6)	**Unfavourable-bad (U2)**
Habitat for the species (see section 7)	**Unfavourable-inadequate (U1)**
Future prospects (see section 10)	**Unfavourable-bad (U2)**

List of Sections

National Level

1. General information

1.1 Country	Wales
1.2 Species code	S1103
1.3 Species scientific name	*Alosa fallax*
1.4 Alternative species scientific name	
1.5 Common name	Twaite shad
Annex(es)	II, V

2. Maps

2.1 Sensitive species	No
2.2 Year or period	1996-2023
2.3 Distribution map	Yes
2.4 Distribution map; Method used	Based mainly on extrapolation from a limited amount of data

2.5 Additional information

No additional information

3. Information related to Annex V Species

3.1 Is the species taken in the wild / exploited?	No
3.2 What measures have been taken?	
a) Regulations regarding access to property	No
b) Temporary or local prohibition on the taking of specimens in the wild and exploitation	No
c) Regulation of the periods and/or methods of taking specimens	No
d) Application of hunting and fishing rules which take account of the conservation of such populations	Yes

e) Establishment of a system of licences for taking specimens or of quotas	Yes
f) Regulation of the purchase, sale, offering for sale, keeping for sale, or transport for sale of specimens	No
g) Breeding in captivity of animal species as well as artificial propagation of plant species	No
Other measures	No
Other measures description	

3.3: Hunting bag or quantity taken in the wild for Mammals and Acipenseridae (Fish)

a) Unit No unit - not reported

Table 2: Quantity taken from the wild during the reporting period (see 3.3a for units). For species with defined hunting seasons, Season 1 refers to 2018/2019 (autumn 2018 to spring 2019), and Season 6 to 2023/2024. For species without hunting seasons, data are reported by calendar year: Year 1 is 2019, and Year 6 is 2024.

	Season/ year 1	Season/ year 2	Season/ year 3	Season/ year 4	Season/ year 5	Season/ year 6
b) Minimum	-	-	-	-	-	-
c) Maximum	-	-	-	-	-	-
d) Unknown	No	No	No	No	No	No

3.4: Hunting bag or quantity taken in the wild; Method used

3.5: Additional information

No additional information

Biogeographical Level

4. Biogeographical and marine regions

4.1 Biogeographical or marine region where the species occurs ATL

4.2 Sources of information

See section 14 References

5. Range

5.1 Surface area (km²)	4,270.11
5.2 Short-term trend; Period	2012-2024
5.3 Short-term trend; Direction	Stable
5.4 Short-term trend; Magnitude	
a) Estimated minimum	
b) Estimated maximum	
c) Pre-defined range	
d) Unknown	Yes
e) Type of estimate	
f) Rate of decrease	
5.5 Short-term trend; Method used	Complete survey or a statistically robust estimate
5.6 Long-term trend; Period	1990-2024
5.7 Long-term trend; Direction	Increasing
5.8 Long-term trend; Magnitude	
a) Minimum	
b) Maximum	
c) Rate of decrease	

5.9 Long-term trend; Method used	Based mainly on expert opinion with very limited data

5.10 Favourable Reference Range (FRR)

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

5.11 Change and reason for change in surface area of range

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

5.12 Additional information

No additional information

6. Population

6.1 Year or period	2019-2024

6.2 Population size (in reporting unit)

a) Unit	number of map 1x1 km grid cells
b) Minimum	
c) Maximum	

d) Best single value	173
6.3 Type of estimate	Best estimate
6.4 Quality of extrapolation to reporting unit	

6.5 Additional population size (using population unit other than reporting unit)

a) Unit	
b) Minimum	
c) Maximum	
d) Best single value	
e) Type of estimate	
6.6 Population size; Method used	Complete survey or a statistically robust estimate
6.7 Short-term trend; Period	2013-2024
6.8 Short-term trend; Direction	Increasing
6.9 Short-term trend; Magnitude	
a) Estimated minimum	
b) Estimated maximum	
c) Pre-defined range	Increasing 0 - 12%
d) Unknown	No
e) Type of estimate	Pre-defined range
f) Rate of decrease	
6.10 Short-term trend; Method used	Based mainly on extrapolation from a limited amount of data
6.11 Long-term trend; Period	1994-2024
6.12 Long-term trend; Direction	Unknown
6.13 Long-term trend; Magnitude	

a) Minimum	
b) Maximum	
c) Confidence interval	
d) Rate of decrease	
6.14 Long-term trend; Method used	Insufficient or no data available

6.15 Favourable Reference Population (FRP)

ai) Population size	
aii) Unit	
b) Pre-defined increment	Current population is between 26% and 50% smaller than the FRP
c) Unknown	No
d) Method used	Reference-based approach
e) Quality of information	high

6.16 Change and reason for change in population size

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

6.17 Additional information

No additional information

6.18 Age structure, mortality and reproduction deviation	Unknown

7. Habitat for the species

7.1 Sufficiency of area and quality of occupied habitat (for long-term survival)

a) Is area of occupied habitat sufficient?	Yes
b) Is quality of occupied habitat sufficient?	No
c) If No or Unknown, is there a sufficiently large area of unoccupied habitat of suitable quality?	No

7.2 Sufficiency of area and quality of occupied habitat; Method used

a) Sufficiency of area of occupied habitat; Method used	Complete survey or a statistically robust estimate
b) Sufficiency of quality of occupied habitat; Method used	Complete survey or a statistically robust estimate
7.3 Short-term trend; Period	2012-2024
7.4 Short-term trend; Direction	Stable
7.5 Short-term trend; Method used	Complete survey or a statistically robust estimate
7.6 Long-term trend; Period	1990-2024
7.7 Long-term trend; Direction	Increasing
7.8 Long-term trend; Method used	

7.9 Additional information

No additional information

8. Main pressures

8.1 Characterisation of pressures

Table 3: Pressures affecting the species, 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	High (H)
PD05: Development and operation of energy production plants (including infrastructure)	Ongoing and likely to be in the future	High (H)
PK01: Mixed source pollution to surface and ground waters (limnic and terrestrial)	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)
PG07: Freshwater fish and shellfish harvesting (recreational)	In the past but now suspended due to measures	Medium (M)
PL01: Abstraction from groundwater, surface water or mixed water (mixed or unknown drivers)	Ongoing and likely to be in the future	Medium (M)
PL05: Modification of hydrological flow (mixed or unknown drivers)	Ongoing and likely to be in the future	High (H)
PL06: Physical alteration of water bodies (mixed or unknown drivers)	Ongoing and likely to be in the future	High (H)

8.2 Sources of information

See section 14 References

8.3 Additional information

No additional information

9. Conservation measures

9.1: Status of measures

a) Are measures needed?	Yes
b) Indicate the status of measures	Measures identified and taken

9.2 Main purpose of the measures taken	Restore the habitat of the species (related to 'Habitat for the species')
9.3 Location of the measures taken	Both inside and outside National Site Network
9.4 Response to measures	Medium-term results (within the next two reporting periods, 2025–2036)

9.5 List of main conservation measures

Table 4: 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	Medium (M)
MC12: Manage water abstraction for resource extraction and energy production	Medium (M)
MK01: Reduce impact of mixed source pollution	High (H)
MK03: Restoration of habitats impacted by multi-purpose hydrological changes	High (H)
MF09: Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (incl. restoration of habitats)	High (H)

9.6 Additional information

No additional information

10. Future prospects

10.1a Future trends of parameters

ai) Range	Overall stable
bi) Population	Overall stable
ci) Habitat for the species	Overall stable

10.1b Future prospects of parameters

aii) Range	Good
bii) Population	Bad
cii) Habitat for the species	Poor

10.2 Additional information

No additional information

11. Conclusions

11.1 Range	Favourable (FV)
11.2 Population	Unfavourable-bad (U2)
11.3 Habitat for the species	Unfavourable-inadequate (U1)
11.4 Future prospects	Unfavourable-bad (U2)
11.5 Overall assessment of Conservation Status	Unfavourable-bad (U2)
11.6 Overall trend in Conservation Status	Improving

11.7 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.

11.7 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.

11.8 Additional information

No additional information

12. UK National Site Network (pSCIs, SCIs, SACs) coverage for Annex II species

12.1 Population size inside the pSCIs, SCIs and SACs network

a) Unit	number of map 1x1 km grid cells
b) Minimum	
c) Maximum	
d) Best single value	172
12.2 Type of estimate	Best estimate
12.3 Population size inside the network; Method used	Complete survey or a statistically robust estimate
12.4 Short-term trend of population size within the network; Direction	Stable
12.5 Short-term trend of population size within the network; Method used	Complete survey or a statistically robust estimate
12.6 Short-term trend of habitat for the species inside the pSCIs, SCIs and SACs network; Direction	Stable
12.7 Short-term trend of habitat for the species inside the pSCIs, SCIs and SACs network; Method used	Complete survey or a statistically robust estimate

12.8 Additional information

No additional information

13. Complementary information

13.1 Justification of percentage thresholds for trends

No justification information

13.2 Trans-boundary assessment

No trans-boundary assessment information

13.2 Other relevant information

No other relevant information

14. References

Biogeographical and marine regions

4.2 Sources of information

Alexandrino P, Faria R, Linhares D, Castro F, Le Corre M, Sabatié R, Baglinière J-L, Weiss S. 2007. Interspecific differentiation and intraspecific substructure in two closely related clupeids with extensive hybridisation, Alosa alosa and Alosa fallax. Journal of Fish Biology 69 (Supplement B): 242-259.

Aprahamian MW, Lester SM, Aprahamian CD. 1999. Shad Conservation in England and Wales. Environment Agency R & D Technical Report W110. Environment Agency, Bristol.

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Caswell, PA, Aprahamian MW. 2001. Use of River Habitat Survey to determine the spawning habitat characteristics of Twaite Shad (Alosa fallax fallax). Bulletin Francais de la Peche et de la Pisciculture 362/363: 919-929.

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Hatton-Ellis, TW. 2025. Evidence Pack for the Conservation Status Assessment of S1103 Twaite shad (Alosa fallax) – First Habitats Regulations 9A Report for Wales. Unpublished internal document, Natural Resources Wales.

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Maitland P, Hatton-Ellis T. 2003. Ecology of the Allis and Twaite Shad. Conserving Natura 2000 Rivers Ecology Series 3. Peterborough, English Nature.

Natural Resources Wales (unpublished) shad monitoring data 2013-2017. Dataset stored on the DMS.

Natural Resources Wales 2018. Severn Estuary / Môr Hafren Special Area of Conservation: Indicative site level feature condition assessments 2018. NRW Evidence Report Series, Report No: 235, 41pp, NRW, Bangor.

Nunn AD, Ainsworth RF, Walton S, Bean CW, Hatton-Ellis TW, Brown A, Evans R, Atterborne A, Ottewell D, Noble RAA. 2023. Extinction risks and threats facing the freshwater fishes of Britain. Aquatic Conservation: Marine and Freshwater Ecosystems 33: 1470-1476.

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Wye and Usk Foundation. 2024. Fishing Passport Catch Return Data. https://www.fishingpassport.co.uk/catch-return

Wynter E, Hatton-Ellis M, Scorey A, Nielsen I, Hatton-Ellis T, Jackson-Bué M, Cuthbertson S. (2025). Condition Assessments for Allis Shad (Alosa alosa) and Twaite Shad (Alosa fallax) in Welsh Special Areas of Conservation. NRW Evidence Report. Bangor: Natural Resources Wales.

Main pressures

8.2 Sources of information

No sources of information

15. Explanatory Notes

Field label	Note
2.4: Distribution map; Method used	Due to under-reporting and difficulties in detecting and identifying the species, the exact distribution of twaite shad in Wales remains uncertain (see also the commentary in section 1.1 of JNCC (2007)). Spawning distribution is focused around the larger rivers entering the Bristol Channel, especially the Usk, Wye and Tywi (Figure 1). There is evidence of a population or populations based on angler and osprey catches in the extreme lower reaches of several Snowdonia rivers including the Dwyryd / Glaslyn, Mawddach, Dyfi, Seiont, Gwyrfai and Dwyfor (Figure 1). The frequency with which fish are recorded in all of these rivers suggests the existence of self-sustaining populations, but numbers are much lower than in the South Wales rivers.
3.2: Which of the measures in Art. 9a have been taken?	Under the Wildlife & Countryside Act 1981 (as amended) it is illegal to fish for twaite shad. Any specimens caught unintentionally must be released alive.
5.1: Surface area	The freshwater range of this species calculated by Alpha hull software is shown in the range map. It should be noted that this is an overestimate as the software incorrectly connects the Tywi and Wye/Usk populations via unsuitable habitat. The range of the species in freshwater is shown in detail in the distribution (Section 2) and population maps (Section 6). The range of shad in Welsh seas is largely unknown and data are poor, but generally suggest that twaite shad are widespread in Welsh marine waters.
5.3: Short-term trend; Direction	Informal assessment of records from the 2019-24 reporting period indicates no substantial change in range compared to the previous reporting period.
5.4: Short-term trend; Magnitude	Previously, range was calculated at a UK level by JNCC using alpha hull software. NRW does not have this software

	or trained staff to use it. JNCC have not provided NRW with a formal calculation of range from the previous reporting round in Wales and thus we are unable to assess whether there has been a change in range using the method used previously.
5.4: Short-term trend; Magnitude	As per 5.4d, there are good data to calculate range, but the suitable software are not accessible to NRW.
5.8: Long-term trend; Magnitude	Not Applicable (range is likely increasing).
5.9: Long-term trend; Method used	The current range of twaite shad in Wales is reasonably well known. Older data are less consistently reported, with the main evidence source being Aprahamian et al. (1999). There has been no decline in range since then and range may have slightly increased; however, apparent increases may simply reflect better understanding of distribution rather than genuine change.
5.11: Change and reason for change in surface area of range	In the main population centres in South Wales, there is no evidence of a change in range. Changes in 10km square records reflect incidental change rather than loss of populations. There is sporadic evidence of a small population in northern Cardigan Bay, consisting of various ad hoc records. No structured monitoring of this population has been carried out. Its continued presence was not confirmed in this reporting cycle, but it has been assumed to be still extant in the 10km square.
6.2: Population size	173 (best single value: 33 actual; 140 interpolated). This measure includes both squares containing actual twaite shad records, and squares along the river network that shad must have accessed to reach these squares, following the procedure agreed by IAFG (2018). The resulting count is a very good estimate of the extent of shad populations in Wales because it removes error due to sampling effort. However, it tends to overemphasise the

	important of upstream spawning locations that may be of marginal importance to the overall population. See Hatton-Eliis (2025) Map 6.2. The current population size represents 72% of the FRV in Wales. This is a slight reduction compared to the previous reporting round (79%), but this is likely to reflect variation in the sampling method and / or natural variation rather than a cause for concern. No relevant population data are available for marine waters.
6.5: Additional population size	Not Applicable. For trend, see Hatton-Eliis (2025) Appendix 4.
6.6: Population size; Method used	The available data covers all known shad spawning locations in Wales. Further investigation of the north Wales rivers may be of value as there is increasing evidence that spawning populations exist there (Figure 1), but these populations are almost certainly much smaller than those in south Wales.
6.8: Short-term trend; Direction	Nunn et al. (2023) assessed the extinction risk of twaite shad using standard IUCN methods and estimated a 41% population decline in Wales over three generations (18 years). The River Severn was used as an index river as this has been extensively monitored, and there is evidence of significant gene flow between this and the Wye and Usk populations. Data from Unlocking the Severn (2024) indicates a rapid recent decline of this population. However, subsequent assessment of spawning and angler catch data from the last two reporting rounds indicates that the trajectory seen in the Severn is not replicated in any of the main Welsh populations (Wye, Usk, Tywi) and therefore that the Severn cannot be used as an index river. The population in the Usk appears to have increased substantially over this period, the Wye population may be increasing, and the Tywi population seems broadly stable. Further details are provided in Hatton-Ellis (2025) Annexe 4.

6.9: Short-term trend; Magnitude	Assessing the magnitude of increase is difficult using the available data as the relative sizes of the different populations are unknown, and individual populations vary significantly from year to year. The above category has been used as a conservative estimate of the most likely population change.
6.10: Short-term trend; Method used	Estimates of short and long term change are based on available monitoring data. Monitoring shad populations is technically very challenging. It is only recently that a cost-effective method based on egg surveys has been developed and deployed (see Thomas & Dyson 2011, 2012a, 2012b, Garrett 2012, 2015, 2017a, 2017b), though it should be noted that this approach focuses more on the spatial distribution of spawning within a river rather than attempting absolute estimates of population size. As a result it has been possible to compare current results with maps of spawning distribution in Welsh rivers (Aprahamian et al. 1999), produced by compiling data from the 1990s. See also NRW (2012).
6.12: Long-term trend; Direction	The length of river accessible to shad in Wales has increased since 1994. However, population trends over this period are unknown.
6.14: Long-term trend; Method used	Assessment of long term trends has not been possible, because there are no suitable older data.
6.16: Change and reason for change in population size	The Unlocking the Severn project found a significant decline in the Severn population of twaite shad, resulting in a UK and Wales Red Listing of Vulnerable due to population decline (Nunn et al. 2023). However, subsequent analysis of angler records and egg counts indicates that shad in Welsh freshwaters are not, in fact, declining, and are likely increasing (Hatton-Ellis 2025 - Appendix 4).
7.1: Sufficiency of area and quality of occupied habitat	The definition of 'suitable unoccupied habitat' for species in the context of the questions here comes from a terrestrial metapopulation perspective, where it is assumed that

unoccupied habitat contributes to the resilience of a species' population, because the species could colonise and exploit it at some time in the future. However, this is only the case if it is possible for the species to colonise it.

In the case of shads, there is suitable but unused spawning habitat upstream of barriers to migration, but which the shad are unable to access. Such habitat is considered unsuitable habitat in the context of this assessment, as it cannot be colonised by shad until access issues have been tackled.

Is area of occupied habitat sufficient (for long-term survival)? YES

Freshwater Area = 1.3 km2 (0.609 high importance; 0.655 low importance).

Marine Area = 10,037.0 km2 (7246 high importance; 2791 low importance)

Shads use multiple habitats at different stages of their life history, all of which are critical to survival. The most important factor is that all habitat types are accessible and of at least adequate quality. Construction of weirs in the 19th and 20th Century eradicated twaite shad from much of the Severn (Aprahamian et al. 1999, Maitland & Hatton-Ellis 2003).

Marine habitat requirements are poorly understood, but they seem to be mainly coastal and pelagic in habit, having been reported from depths between 10-150 m. A suitable estuarine habitat is likely to be very important for adults and juveniles (Maitland and Hatton-Ellis, 2003; Davies et al. 2020).

In Wales, twaite shad occur in 12 Water Framework Directive (WFD) river water bodies in Wales, constituting about 400km and 1.3km2 of river. The sum of accessible

habitat is less than the total length of water bodies because shad do not access all parts of all water bodies. These are listed in Hatton-Ellis (2025) Annexe 3.

In the marine environment, twaite shad are considered likely to utilise seven estuaries comprising 1,383km2 of habitat, and nine coastal water bodies comprising approximately 8,654km2 of habitat. Data on the utilization of marine habitat by twaite shad are sparse, but a recent acoustic tracking study (Davies et al. 2020) showed that shad from the Severn range widely in coastal waters during the marine phase.

As the area of freshwater habitat is likely to be limiting for the species, the area of freshwater habitat is used as the key statistic.

Is quality of occupied habitat sufficient (for long-term survival)? NO

Of the water bodies considered to support shad, none were classed as Heavily Modified and where Morphology or Hydrological Regime had been assessed, all water bodies were considered to support Good Status for morphology / hydromorphology. However, weirs on the Usk remain partial barriers to migration.

Water Quality

2024 Common Standards Monitoring data (NRW, in prep) indicates that most of the water bodies that support shad are passing their water quality targets. In the Afon Tywi, both water bodies supporting shad are passing all of their water quality targets. In the three Usk water bodies, most water quality targets are passed but phosphate and diatom targets fail in one of the three with a further water body being unknown. In the Wye, there are some low confidence BOD failures and a single phosphorus failure; the majority of water bodies pass.

2021 WFD Classification data indicates that 3 of these water bodies were at Good Status and 10 were at Moderate Status. Failing WFD elements included phosphate, copper, macrophytes & phytobenthos, zinc, priority substances, and fish.

Although these failures are spatially wide-ranging, their magnitude tends to be small. In five of the water bodies reported as being at Moderate Status, this classification was Uncertain, which indicates that the failure was marginal in nature. WFD Tools are optimised to measure river ecological quality in generic terms and therefore the applicability of these data to shad is uncertain. The seasonal nature of shad presence in rivers will also mitigate against impacts occurring in autumn and winter. Finally, shad are probably more sensitive to morphological than water quality impacts. However, morphological impacts are inadequately reflected in the existing classification data.

River habitat quality is apparently close to the Good-Moderate boundary in most instances, but there is significant uncertainty regarding the applicability of river habitat data to shad.

In the marine environment, most key habitat supporting shad is worse than Good status, with a range of issues identified including biological evidence of eutrophication, failing its chemical standards, with issues identified for mercury and its compounds, brominated diphenylether and dissolved inorganic nitrogen (NRW 2018a, 2018b, 2018c, 2021, Wynter et al 2025).

a) If answered NO or Unknown to 7.1a and/or 7.1b,If 7a NO, is there a sufficiently large area of occupied and unoccupied habitat of suitable quality (for long-term survival)? YES/NO/Unknown

Sufficient occupied and unoccupied = NO

	Barriers to migration prevent shad access to habitat in the Upper Severn in Wales. This habitat is therefore unsuitable at present, but if the barrier issue can be resolved, is likely to be otherwise suitable to support shad. Further research is required to understand the critical tolerances of shad in the context of current environmental standards, especially in the marine environment.
7.2: Sufficiency of area and quality of occupied habitat; Methods used	There is a very good evidence base on the location of barriers that affect shad migration (e.g. Aprahamian et al. 1999; Unlocking the Severn project). Water Framework Directive monitoring data provides a detailed and spatially widespread baseline, subject to the caveats regarding its ecological relevance noted above.
7.4: Short-term trend; Direction	The area and quality of habitat for the species in Wales are considered to be stable.
7.5: Short-term trend; Method used	The data collected are good quality.
7.7: Long-term trend; Direction	Access for shad in Wales has been improved at several barriers, particularly in the Usk. There have also been long-term improvements to water quality over this period (especially during 1990-2005) as a result of the implementation of the Urban Waste Water Directive.
8.1: Characterisation of pressures	Pressures: Shads are highly sensitive to river modifications that impair fish passage (PL06). They avoid turbulent flows and do not leap over barriers. Consequently, obstructions that other migratory fish pass with relative ease can be partial or complete barriers to shad. These particularly include weirs and dams constructed for various purposes including water abstraction, but even bridge footings can have a significant impact. Water abstractions (PL01, PL05) also remove eggs drifting downstream, although the significance of this in the context

of the population is uncertain.

Other physical modifications to water bodies such as river straightening and bank reinforcement may damage both the riffle habitat used for spawning and the backwaters and deep pools used by juveniles in freshwater.

Although shads are less pollution sensitive than fish such as salmonids, they are nevertheless vulnerable to pollution impacts (PK01, PK02). Increasingly intensive farming regimes in South Wales are therefore of concern. However, since fish are only present in rivers in summer, they are less likely to be exposed to slurry pollution, which occurs mainly in winter.

In the marine environment, cooling systems for power stations (PD05) entrain very large numbers of fish, including juvenile shad (Henderson 2003; Aprahamian et al. 2010). These impacts cannot be reflected by the existing population or range metrics as these relate only to the freshwater stage and are predominantly spatial in nature. Further monitoring data to quantify the impact of this pressure is needed.

Threats:

All of the above pressures are also threats for the future. In addition, tidal power schemes (PD01) that have been proposed in multiple locations around the Welsh coast are a particular cause for concern, as inappropriately designed or sited schemes could have significant negative impacts on migrating or subadult shad populations.

Twaite shad are pelagic fish and feed on small semi-transparent prey in the freshwater (PK01) and marine environment (PK02). This makes it likely that they ingest microplastics (cf Phillips & Bonner 2015). At present this is not monitored and the impact of this potential pressure is therefore unknown. This is an emerging area in research at

	present and it is hoped that appropriate monitoring may be identified to assess this threat.
9.1: Status of measures	The 4Rivers4LIFE project is currently working to deliver improvements to migration access in the Usk catchment. The Unlocking the Severn project delivered improvements to migration access in the lower Severn, however further measures will be required to bypass additional obstacles before shad can again access their historic spawning grounds in Wales.
9.2: Main purpose of the measures taken	It should however be noted that restoring habitat will also result in restoration of the range and population size of shad in Wales.
9.3: Location of the measures taken	Measures are needed on both the Usk and Severn catchments.
9.4: Response to the measures	This reflects the timescale over which shad operate, since it typically takes c. 6 years from egg to adult.
9.5: List of main conservation measures	Measures selected are specifically to address pressures identified in Section 8. The highest priority actions are to continue to improve migratory access for twaite shad. This will likely to benefit other migratory fish such as allis shad, salmon and migratory lampreys.
10.1: Future trends and prospects of parameters	10.1 a) Twaite shad have shown a stable or slight increase in range in the recent past, which likely reflects a response to climate change since these are a warm water species. The scope for further expansion without addressing barrier issues is limited however. 10.1 b) The current population is considered stable and / or slightly increasing, and is likely to remain so given currently available knowledge. However, it should be noted that the Severn twaite shad population has been rapidly declining recently for unknown reasons (Unlocking the Severn, unpublished). 10.1 c) There are no good reasons to expect a marked

	deterioration in habitat extent or quality for shad in the near future.
11.1: Range	Conclusion on Range reached because: (i) the short-term trend direction in Range surface area is stable; and (ii) the current Range surface area is approximately equal to the Favourable Reference Range.
11.2: Population	Conclusion on Population reached because:(i) the short-term trend direction in Population size is increasing; (ii) the current Population size is more than 25% below the Favourable Reference Population and iii) reproduction, mortality and age structure does not have data available.
11.3: Habitat for the species	Conclusion on Habitat for species reached because: i) the area of occupied habitat is sufficiently large for the long-term survival of the species (ii) the quality of occupied habitat is not suitable for the long-term survival of the species; and iii) there is a not a sufficiently large area of occupied and unoccupied habitat of suitable quality for long term survival (iv) the short-term trend in area of habitat is stable; and v) expert opinion determines that the habitat quality of occupied and unoccupied habitat is not bad; and vi) expert opinion determines that the habitat area is insufficient, but not clearly so.
11.4: Future prospects	Conclusion on Future prospects reached because: (i) the Future prospects for Range are good; (ii) the Future prospects for Population are bad; and (iii) the Future prospects for Habitat for the species are poor.
11.5: Overall assessment of Conservation Status	Overall assessment of Conservation Status is Unfavourable-bad because two of the conclusions are Unfavourable-bad.
12.1: Population size inside the pSCIs, SCIs and SACs network	172 (99% of Welsh resource) All except one of the current 1km squares are associated

	with a shad population within and specifically protected by the SAC network. A few additional records lie outside the SAC boundary but inside a corresponding 1km square for a SAC.
6.15: Favourable Reference Population (FRP)	The UK-level FRV for population was developed by JNCC using an audit trail based on the year the FRV was first established and any changes made in subsequent reporting rounds. The audit may draw from any combination of the 2007, 2013, or 2019 Habitats Directive reports and reflects the full rationale used for the 2019 Article 17 reporting. Following expert review, a Wales-level FRV was derived based on population trend and abundance data specific to Wales, rather than adopting the UK-level value. The revised FRV has been set as unpublished NRW GIS analysis indicated that the Wales FRP could be estimated at 240 1 x 1 km grid squares, with the current population being 28% smaller at 173 1 x 1 km grid squares. Therefore the operator of between 26 and 50% smaller than FRP was selected.
5.10: Favourable Reference Range (FRR)	The UK-level FRV for range was developed by JNCC using an audit trail based on the year the FRV was first established and any changes made in subsequent reporting rounds. The audit may draw from any combination of the 2007, 2013, or 2019 Habitats Directive reports and reflects the full rationale used for the 2019 Article 17 reporting. Following expert review, a Wales-level FRV was derived based on distribution and trend evidence specific to Wales, rather than adopting the UK-level value. The revised FRV has been set as unpublished NRW GIS analysis indicated that the Wales FRR could be 4270 km2 with the current range being approximately equal to this. Therefore an operator of 'less than 2% smaller than the FRR' was selected for this species.