European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC)

Fourth Report by the United Kingdom under Article 17

on the implementation of the Directive
from January 2013 to December 2018

Supporting documentation for the
conservation status assessment for the species:

S1103 - Twaite shad (*Alosa fallax*)

WALES

IMPORTANT NOTE - PLEASE READ

- The information in this document is a country-level contribution to the UK Report on the conservation status of this species, submitted to the European Commission as part of the 2019 UK Reporting under Article 17 of the EU Habitats Directive.
- The 2019 Article 17 UK Approach document provides details on how this supporting information was used to produce the UK Report.
- The UK Report on the conservation status of this species is provided in a separate document.
- The reporting fields and options used are aligned to those set out in the European Commission guidance.
- Explanatory notes (where provided) by the country are included at the end. These provide an audit trail of relevant supporting information.
- Some of the reporting fields have been left blank because either: (i) there was insufficient information to complete the field; (ii) completion of the field was not obligatory; (iii) the field was not relevant to this species (section 12 Natura 2000 coverage for Annex II species) and/or (iv) the field was only relevant at UK-level (sections 9 Future prospects and 10 Conclusions).
- For technical reasons, the country-level future trends for Range, Population and Habitat for the species are only available in a separate spreadsheet that contains all the country-level supporting information.
- The country-level reporting information for all habitats and species is also available in spreadsheet format.

Visit the JNCC website, https://jncc.gov.uk/article17, for further information on UK Article 17 reporting.

Report on the main results of the surveillance under Article 11 for Annex II, IV and V species (Annex B)

NATIONAL LEVEL

1. General information

1.1 Member State	**UK (Wales information only)**
1.2 Species code	**1103**
1.3 Species scientific name	**Alosa fallax**
1.4 Alternative species scientific name	
1.5 Common name (in national language)	Twaite shad

2. Maps

2.1 Sensitive species	No
2.2 Year or period	1996-2018
2.3 Distribution map	Yes
2.4 Distribution map Method used	Complete survey or a statistically robust estimate
2.5 Additional maps	No

3. Information related to Annex V Species (Art. 14)

3.1 Is the species taken in the wild/exploited?	No	
3.2 Which of the measures in Art. 14 have been taken?	a) regulations regarding access to property	No
	b) temporary or local prohibition of 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	No
	e) establishment of a system of licences for taking specimens or of quotas	No
	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
	h) other measures	No

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

a) Unit

b) Statistics/ quantity taken	Provide statistics/quantity per hunting season or per year (where season is not used) over the reporting period					
	Season/ year 1	Season/ year 2	Season/ year 3	Season/ year 4	Season/ year 5	Season/ year 6
Min. (raw, ie. not rounded)						
Max. (raw, ie. not rounded)						
Unknown	No	No	No	No	No	No

3.4. Hunting bag or quantity taken in the wild Method used

3.5. Additional information

BIOGEOGRAPHICAL LEVEL

4. Biogeographical and marine regions

4.1 Biogeographical or marine region where the species occurs

Atlantic (ATL)

4.2 Sources of information

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Natural Resources Wales 2018b. Severn Estuary / Mor Hafren Special Area of Conservation: Indicative site level feature condition assessments 2018. NRW Evidence Report Series, Report No: 235, 41pp, NRW, Bangor.
Natural Resources Wales, 2018c. Pembrokeshire Marine / Sir Benfro Forol Special Area of Conservation: Indicative site level feature condition assessments 2018. NRW Evidence Report Series, Report No: 233, 67pp, NRW, Bangor.
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5. Range

5.1 Surface area (km²)		
5.2 Short-term trend Period		
5.3 Short-term trend Direction	Stable (0)	
5.4 Short-term trend Magnitude	a) Minimum	b) Maximum
5.5 Short-term trend Method used		

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5.6 Long-term trend Period		
5.7 Long-term trend Direction		
5.8 Long-term trend Magnitude	a) Minimum	b) Maximum
5.9 Long-term trend Method used		
5.10 Favourable reference range	a) Area (km²) b) Operator c) Unknown d) Method	
5.11 Change and reason for change in surface area of range	No change The change is mainly due to:	
5.12 Additional information		

6. Population

6.1 Year or period	2013-2018	
6.2 Population size (in reporting unit)	a) Unit	number of map 1x1 km grid cells (grids1x1)
	b) Minimum	
	c) Maximum	
	d) Best single value	184
6.3 Type of estimate	Best estimate	
6.4 Additional population size (using population unit other than reporting unit)	a) Unit b) Minimum c) Maximum d) Best single value	
6.5 Type of estimate		
6.6 Population size Method used	Complete survey or a statistically robust estimate	
6.7 Short-term trend Period	2006-2018	
6.8 Short-term trend Direction	Stable (0)	
6.9 Short-term trend Magnitude	a) Minimum b) Maximum c) Confidence interval	
6.10 Short-term trend Method used	Complete survey or a statistically robust estimate	
6.11 Long-term trend Period	1994-2018	
6.12 Long-term trend Direction	Increasing (+)	
6.13 Long-term trend Magnitude	a) Minimum b) Maximum c) Confidence interval	
6.14 Long-term trend Method used	Complete survey or a statistically robust estimate	

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6.15 Favourable reference population (using the unit in 6.2 or 6.4)	a) Population size b) Operator c) Unknown d) Method	
6.16 Change and reason for change in population size	Use of different method The change is mainly due to:	Use of different method
6.17 Additional information		

7. Habitat for the species

7.1 Sufficiency of area and quality of occupied habitat	a) Are area and quality of occupied habitat sufficient (to maintain the species at FCS)?	No
	b) Is there a sufficiently large area of occupied AND unoccupied habitat of suitable quality (to maintain the species at FCS)?	Yes
7.2 Sufficiency of area and quality of occupied habitat Method used	Complete survey or a statistically robust estimate	
7.3 Short-term trend Period	2012-2018	
7.4 Short-term trend Direction	Stable (0)	
7.5 Short-term trend Method used	Complete survey or a statistically robust estimate	
7.6 Long-term trend Period		
7.7 Long-term trend Direction		
7.8 Long-term trend Method used		
7.9 Additional information		

8. Main pressures and threats

8.1 Characterisation of pressures/threats

Pressure	Ranking
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	M
Mixed source marine water pollution (marine and coastal) (J02)	M
Abstraction from groundwater, surface water or mixed water (K01)	M
Modification of hydrological flow (K04)	H
Physical alteration of water bodies (K05)	H
Development and operation of energy production plants (including bioenergy plants, fossil and nuclear energy plants) (D05)	M

Threat	Ranking
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	M

Mixed source marine water pollution (marine and coastal) (J02)	M
Abstraction from groundwater, surface water or mixed water (K01)	M
Modification of hydrological flow (K04)	M
Physical alteration of water bodies (K05)	H
Wind, wave and tidal power, including infrastructure (D01)	H
Development and operation of energy production plants (including bioenergy plants, fossil and nuclear energy plants) (D05)	H

8.2 Sources of information

8.3 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: Expand the current range of the species (related to 'Range')

9.3 Location of the measures taken: Both inside and outside Natura 2000

9.4 Response to the measures: Medium-term results (within the next two reporting periods, 2019-2030)

9.5 List of main conservation measures

Reduce/eliminate point pollution to surface or ground waters from agricultural activities (CA10)
Reduce diffuse pollution to surface or ground waters from agricultural activities (CA11)
Manage water abstraction for resource extraction and energy production (CC13)
Reduce impact of mixed source pollution (CJ01)
Restore habitats impacted by multi-purpose hydrological changes (CJ03)
Other measures related to mixed source pollution and multi-purpose human-induced changes in hydraulic conditions (CJ04)

9.6 Additional information

10. Future prospects

10.1 Future prospects of parameters

a) Range

b) Population

c) Habitat of the species

10.2 Additional information

11. Conclusions

11.1. Range

11.2. Population

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11.3. Habitat for the species	
11.4. Future prospects	
11.5 Overall assessment of Conservation Status	
11.6 Overall trend in Conservation Status	
11.7 Change and reasons for change in conservation status and conservation status trend	a) Overall assessment of conservation status No change The change is mainly due to: b) Overall trend in conservation status No change The change is mainly due to:
11.8 Additional information	

12. Natura 2000 (pSCIs, SCIs and SACs) coverage for Annex II species

12.1 Population size inside the pSCIs, SCIs and SACs network (on the biogeographical/marine level including all sites where the species is present)	a) Unit	number of map 1x1 km grid cells (grids1x1)
	b) Minimum	
	c) Maximum	
	d) Best single value	182
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 (0)	
12.5 Short-term trend of population size within the network Method used	Complete survey or a statistically robust estimate	
12.6 Additional information		

13. Complementary information

13.1 Justification of % thresholds for trends
13.2 Trans-boundary assessment
13.3 Other relevant Information

Distribution Map

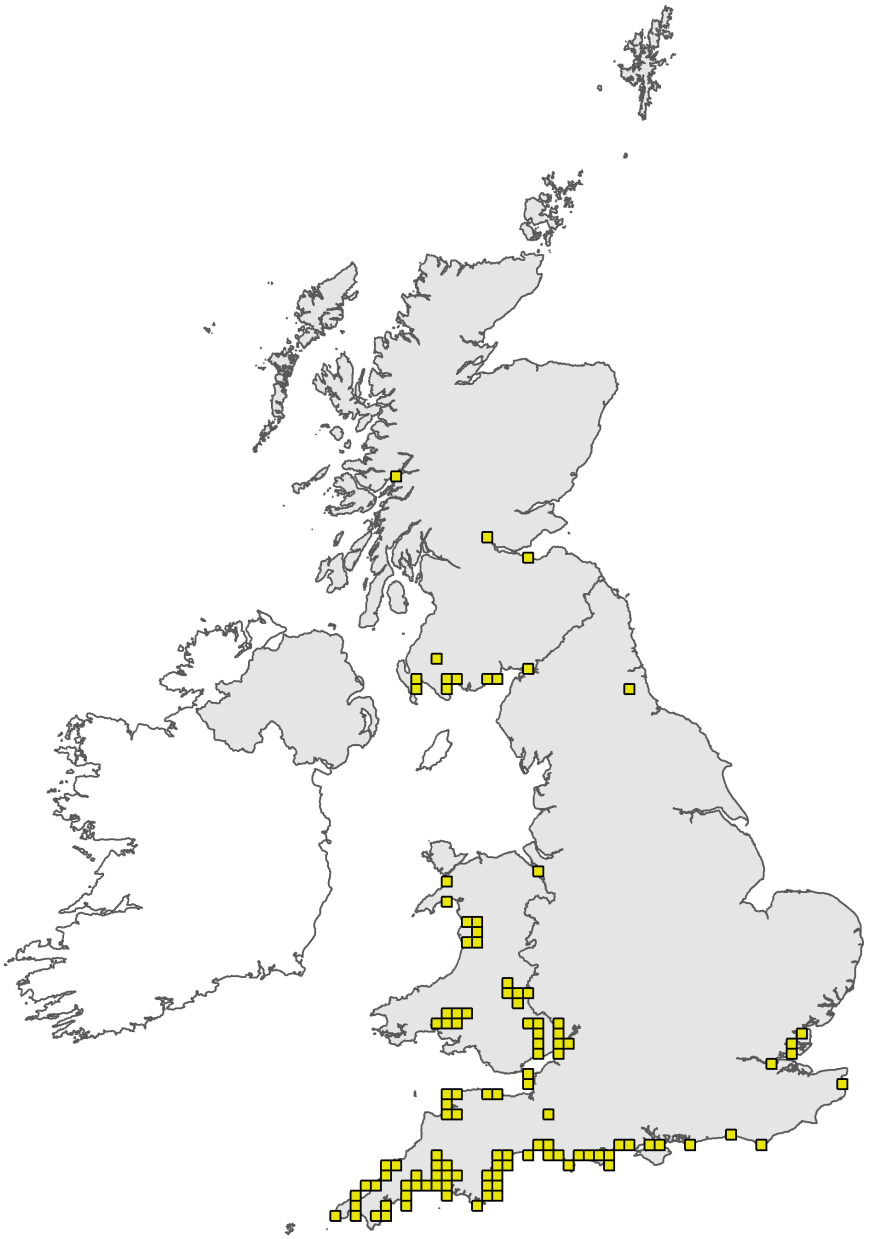

Figure 1: UK distribution map for S1103 - Twaite shad (*Alosa fallax*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

The 10km grid square distribution map is based on available species records within the current reporting period. For further details see the 2019 Article 17 UK Approach document.

Range Map

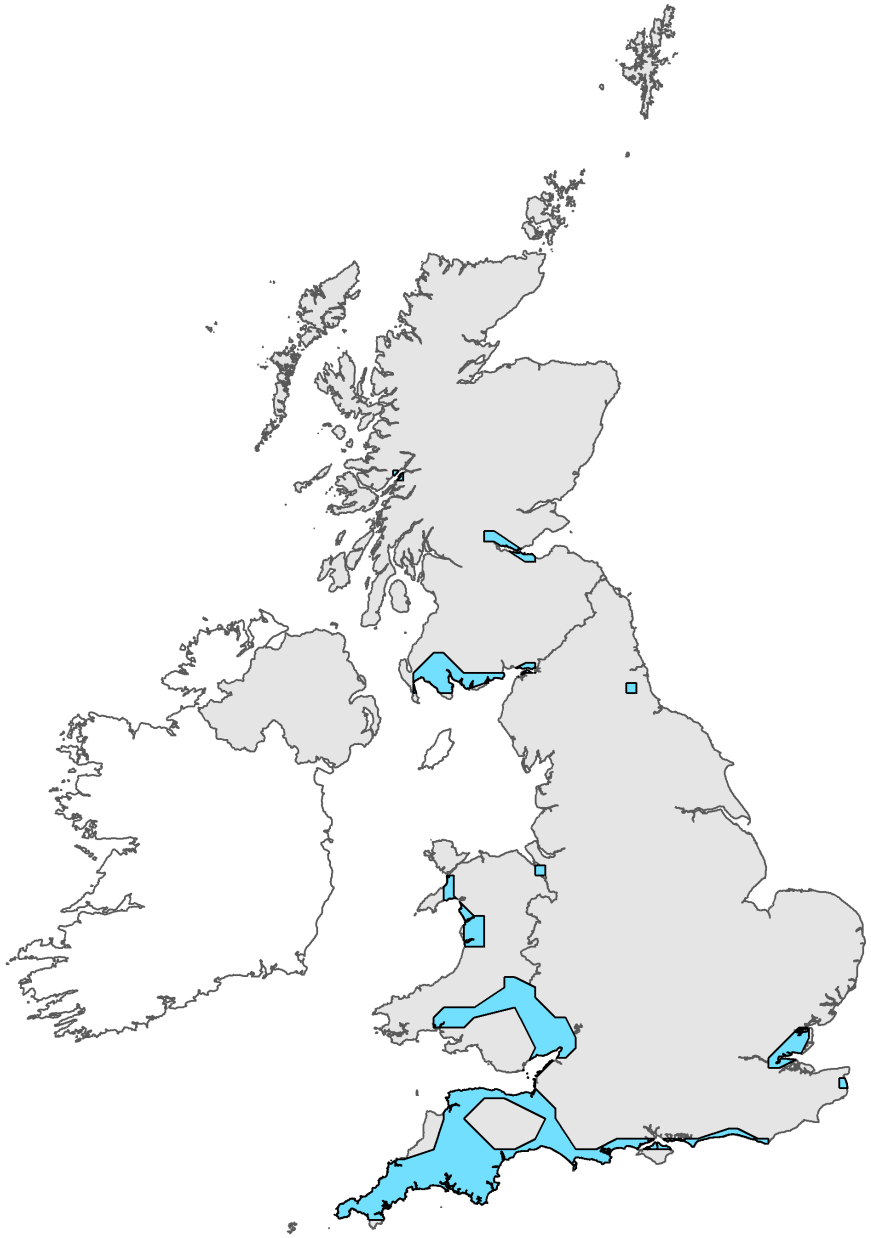

Figure 2: UK range map for S1103 - Twaite shad (*Alosa fallax*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

The range map has been produced by applying a bespoke range mapping tool for Article 17 reporting (produced by JNCC) to the 10km grid square distribution map presented in Figure 1. The alpha value for this species was 25km. For further details see the 2019 Article 17 UK Approach document.

Explanatory Notes

Species name: Alosa fallax (1103)

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 2.1). 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 2.1). 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. The favourable reference distribution map (Figure 2.2) has been slightly updated based on newly discovered information on the 1994 distribution of this species in North Wales.

Species name: Alosa fallax (1103) Region code: ATL

Field label	Note
5.3 Short term trend; Direction	See 5.11
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. 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. In line with practice for other taxa, these data have not been used in the population assessment.
6.2 Population size	184 = best single value with 28 actual; 156 interpolated.
6.2 Population size	This 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. See Map 6.2. The current population size represents 77% of the FRV in Wales. No relevant population data are available for marine waters.
6.4 Additional population size	Previously twaite shad were assessed using the length of river occupied (Hatton-Ellis et al. 2012). Since the EU reporting unit is an equivalent unit, river length has not been recalculated. Instead, the 2013 population unit has been converted to the current unit for the purposes of calculating trends. An interagency paper (IAFG 2018) has agreed to standardise freshwater species methods in rivers, including shad, using the EU reporting unit where available.
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 (Map 2.1), but these populations are almost certainly much smaller than those in south Wales.
6.8 Short term trend; Direction	Between 2006-2012, using the same methods as above, 188 1km squares contained shad. The difference in range is explained by shad being recorded slightly further upstream in the Usk than in 2013-18. These differences are considered insignificant at a Wales level and the population is therefore considered stable.

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	Long-term trend was reported as increasing in 2013 and this is assumed still to apply.
6.13 Long term trend; Magnitude	Not available. Long-term trend data are available but would need to be recalculated to match the revised reporting unit.
6.14 Long 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).
6.16 Change and reason for change in population size	There has been no appreciable change in shad population between reporting periods, but the reporting unit has changed from length of occupied river in km to the EU standard reporting unit of number of occupied 1km squares.
7.1 Sufficiency of area and quality of occupied habitat	In Wales, twaite shad occur in 13 Water Framework Directive (WFD) river water bodies in Wales, constituting about 300km of habitat. None of these water bodies 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. 2015 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. For river water bodies supporting shad in Wales there is a mismatch between river quality and population data. River habitat quality is apparently close to the Good-Moderate boundary in most instances, and 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). Overall = NO b) If NO, is there a sufficiently large area of occupied & unoccupied habitat of suitable quality (to maintain the species at FCS)? sufficient occupied = NO sufficient unoccupied = YES Overall = YES Habitat in the Upper Severn in Wales is considered to be of suitable quality to support shad population were barriers to migration removed or passed. 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; Method used	Water Framework Directive monitoring data provides a detailed and spatially widespread baseline, subject to the caveats regarding its ecological relevance noted above.
8.1 Characterisation of pressures/ threats	Pressures: Shads are highly sensitive to river modifications that impair fish passage (K01, K03, K04, K05). 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 (K03), but even bridge footings (K04, K05) can have a significant impact. Water abstractions 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 (K05) 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 (J01). 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 (D05) 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 (D01) 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 shad populations. Twaite shad are pelagic fish and feed on small semi-transparent prey in the freshwater (J01) and marine environment (J02). 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.
9.5 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 (CJ03, CJ04). This will likely to benefit other migratory fish such as allis shad, salmon and migratory lampreys.
10.1 Future prospects of parameters	10.1 a) Future trend in range in Wales is expected to be stable or increasing (see text for 10.1b). Climate change could also result in some range extensions northward by making rivers currently unused by shad more thermally suitable. 10.1 b) The Unlocking the Severn LIFE project has the potential to restore twaite shad to virtually all of its historic range in western Britain, including Welsh sections of the Severn. Even if the project does not achieve this, it will be a strong platform for future accessibility work. 10.1 c) There are no good reasons to expect a marked deterioration in habitat extent or quality for shad in the near future.
12.1 Population size inside the pSCIs, SCIs and SACs network	d) 182 (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