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*)

SCOTLAND

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 (Scotland 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	1990-2017
2.3 Distribution map	Yes
2.4 Distribution map Method used	Based mainly on extrapolation from a limited amount of data
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

Aprahamian MW, Aprahamian CD, Bagliniere JL, Sabatie R & Alexandrino P 2003. Alosa alosa and Alosa fallax spp. Literature Review and Bibliography. Bristol, Environment Agency R&D Technical Report W1-014/TR, xxiii + 349pp.

SLR Consulting Ltd 2018. Allis and twaite shad in Scotland - information and data. Report to Scottish Natural Heritage

Davies, CE, Shelley, J, Harding, PT, Mclean, IFG, Gardiner, R & Peirson, G (Eds.) 2004. Freshwater Fishes in Britain: The species and their distribution. Colchester: Harley Books.

Hillman RJ, Cowx IG & Harvey JP 2003. Monitoring Allis and Twaite Shad. Conserving Natura 2000 Rivers Monitoring Series No.3. English Nature, Peterborough, 24pp

Lyle A & Maitland PS 1995. A Questionnaire Survey of Inshore Catches of Shad, Smelt and Sturgeon in Scotland. Scottish Natural Heritage Contract Report SNH/011D/93/AEB, 10pp.

Jolly MT, Aprahamian MW, Hawkins SJ, Henderson PA, Hillman R, O'Maoileidigh N, Maitland PS, Piper R & Genner MJ 2012. Population genetic structure of protected allis shad (Alosa alosa) and twaite shad (Alosa fallax). Marine Biology 159, 675-687.

Jolly MT, Maitland PS & Genner MJ 2011. Genetic monitoring of two decades of hybridization between allis shad (Alosa alosa) and twaite shad (Alosa fallax). Conservation Genetics 12, 1087-1100.

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Maitland PS 2007. Scotland's Freshwater Fish - Ecology, Conservation and Folklore,Oxford Trafford Publishing, 287-291

Maitland PS & Hatton-Ellis TW 2003. The Ecology of the Allis and Twaite Shad. Conserving Natura 2000 Rivers Ecology Series No.3. English Nature, Peterborough, 28pp
Maitland PS & Lyle AA 1995. Shad and Smelt in the Cree Estuary, S.W. Scotland. Scottish Natural Heritage Contract Report SNH/11A93AEB1 and SNH/11A93AEB2, 137pp
Maitland PS & Lyle AA 2001. Shad and Smelt in the Cree Estuary, South West Scotland. Scottish Natural Heritage Research, Survey and Monitoring Report No. 6, 139pp
Maitland, PS 1994. Fish. In: The Fresh Waters of Scotland: A National resource of International Significance. (eds. P.S. Maitland, P.J. Boon & D.S. McLusky),. pp.191-208.
Maitland, PS 2004 Keys to the Freshwater Fish of Britain and Ireland with notes on their distribution and ecology . Freshwater Biological Association , Scientific Publication No. 62, 245pp.
Maitland PS & Lyle, AA 1990. Practical conservation of British fishes: current action on six declining species. Journal of Fish Biology (Suppl. A) 1, 25-54.
McColl D, Gregg L, Yeomans WE & McGillivray C 2012. Bullhead and shad in Scotland. Report to Scottish Natural Heritage
National Biodiversity Network 2018. Twaite shad records to 2018. Accessed May 2018. https://species.nbnatlas.org/species/NHMSYS0000544611
records
Galloway Fisheiries Trust (Records of Twaite shad within the Solway catchment 2004-2018)
Biological Records Centre (dp77) - Records provided by Biological Records Centre, accessed through NBN Atlas website.
Database for the Atlas of Freshwater Fishes (dr741) - Records provided by Database for the Atlas of Freshwater Fishes, accessed through NBN Atlas website.

5. Range

5.1 Surface area (km²)		
5.2 Short-term trend Period		
5.3 Short-term trend Direction	Uncertain (u)	
5.4 Short-term trend Magnitude	a) Minimum	b) Maximum
5.5 Short-term trend Method used		
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	Unable to provide a favourable reference range - the data available is insufficient to allow this.	

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6. Population

6.1 Year or period	1990-2017	
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	8
6.3 Type of estimate	Minimum	
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	Based mainly on expert opinion with very limited data	
6.7 Short-term trend Period		
6.8 Short-term trend Direction	Unknown (x)	
6.9 Short-term trend Magnitude	a) Minimum	
	b) Maximum	
	c) Confidence interval	
6.10 Short-term trend Method used	Insufficient or no data available	
6.11 Long-term trend Period		
6.12 Long-term trend Direction		
6.13 Long-term trend Magnitude	a) Minimum	
	b) Maximum	
	c) Confidence interval	
6.14 Long-term trend Method used		
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	No change	
	The change is mainly due to:	
6.17 Additional information	Not possible to determine change with data available.	

7. Habitat for the species

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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)?	Yes
	b) Is there a sufficiently large area of occupied AND unoccupied habitat of suitable quality (to maintain the species at FCS)?	
7.2 Sufficiency of area and quality of occupied habitat Method used	Based mainly on expert opinion with very limited data	
7.3 Short-term trend Period	2005-2017	
7.4 Short-term trend Direction	Uncertain (u)	
7.5 Short-term trend Method used	Based mainly on extrapolation from a limited amount of data	
7.6 Long-term trend Period		
7.7 Long-term trend Direction		
7.8 Long-term trend Method used		
7.9 Additional information	Habitat quality and quantity appears unchanged from pervious reporting cycle. There are no historical spawning records for Allis or Twaite shad in Scotland, although they are occasionally captured in Scottish estuarine and coastal areas.	

8. Main pressures and threats

8.1 Characterisation of pressures/threats

Pressure	Ranking
Agricultural activities generating point source pollution to surface or ground waters (A25)	M
Agricultural activities generating diffuse pollution to surface or ground waters (A26)	M
Forestry activities generating marine pollution (B25)	M
Modification of hydrological conditions, or physical alteration of water bodies and drainage for forestry (including dams) (B27)	M
Wind, wave and tidal power, including infrastructure (D01)	M
Industrial or commercial activities and structures generating marine pollution (excluding marine macro- and micro-particular pollution) (F21)	M
Modification of hydrological flow (K04)	M
Physical alteration of water bodies (K05)	M
Temperature changes (e.g. rise of temperature & extremes) due to climate change (N01)	H
Increases or changes in precipitation due to climate change (N03)	H

Threat	Ranking
Agricultural activities generating point source pollution to surface or ground waters (A25)	M
Agricultural activities generating diffuse pollution to surface or ground waters (A26)	M

Forestry activities generating marine pollution (B25)	M
Modification of hydrological conditions, or physical alteration of water bodies and drainage for forestry (including dams) (B27)	M
Wind, wave and tidal power, including infrastructure (D01)	M
Industrial or commercial activities and structures generating marine pollution (excluding marine macro- and micro-particular pollution) (F21)	M
Modification of hydrological flow (K04)	M
Physical alteration of water bodies (K05)	M
Temperature changes (e.g. rise of temperature & extremes) due to climate change (N01)	H
Increases or changes in precipitation due to climate change (N03)	H

8.2 Sources of information

8.3 Additional information

9. Conservation measures

9.1 Status of measures

a) Are measures needed? No

b) Indicate the status of measures

9.2 Main purpose of the measures taken

9.3 Location of the measures taken

9.4 Response to the measures

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 drainage and irrigation operations and infrastructures (CB14)
Reduce/eliminate noise, light, thermal and other forms of pollution related to resource exploitation and energy production (CC12)
Reduce/eliminate marine pollution from industrial, commercial, residential and recreational areas and activities (CF07)
Control/eradication of illegal killing, fishing and harvesting (CG04)
Reduce bycatch and incidental killing of non-target species (CG05)
Adopt climate change mitigation measures (CN01)

9.6 Additional information

No specific conservation measures are required in Scotland, beyond ensuring that habitat quality remains suitable for this species, and that access to these riverine and estuarine habitats is assured. This species is protected under Schedule 5 of the Wildlife & Countryside Act 1981 (as amended).

10. Future prospects

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10.1 Future prospects of parameters	a) Range b) Population c) Habitat of the species
10.2 Additional information	Continuing improvements to water quality (in rivers and coastal waters) and the removal of in-river barriers suggest that the prospects for shad is improving. However, this must be viewed light of the fact that shad have never spawned in Scottish waters.

11. Conclusions

11.1. Range	
11.2. Population	
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	1
12.2 Type of estimate	Minimum	
12.3 Population size inside the network Method used	Based mainly on expert opinion with very limited data	
12.4 Short-term trend of population size within the network Direction	Unknown (x)	
12.5 Short-term trend of population size within the network Method used	Based mainly on extrapolation from a limited amount of data	
12.6 Additional information	There are no SACs for this species in Scotland. Data obtained from NBN records and 2017 questionnaire survey.	

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13. Complementary information

13.1 Justification of % thresholds for trends	
13.2 Trans-boundary assessment	
13.3 Other relevant Information	There are no SACs for Twaite shad in Scotland and routine surveillance is not carried out. This makes it impossible to establish short or long term trends in either habitat availability or population size.

Distribution Map

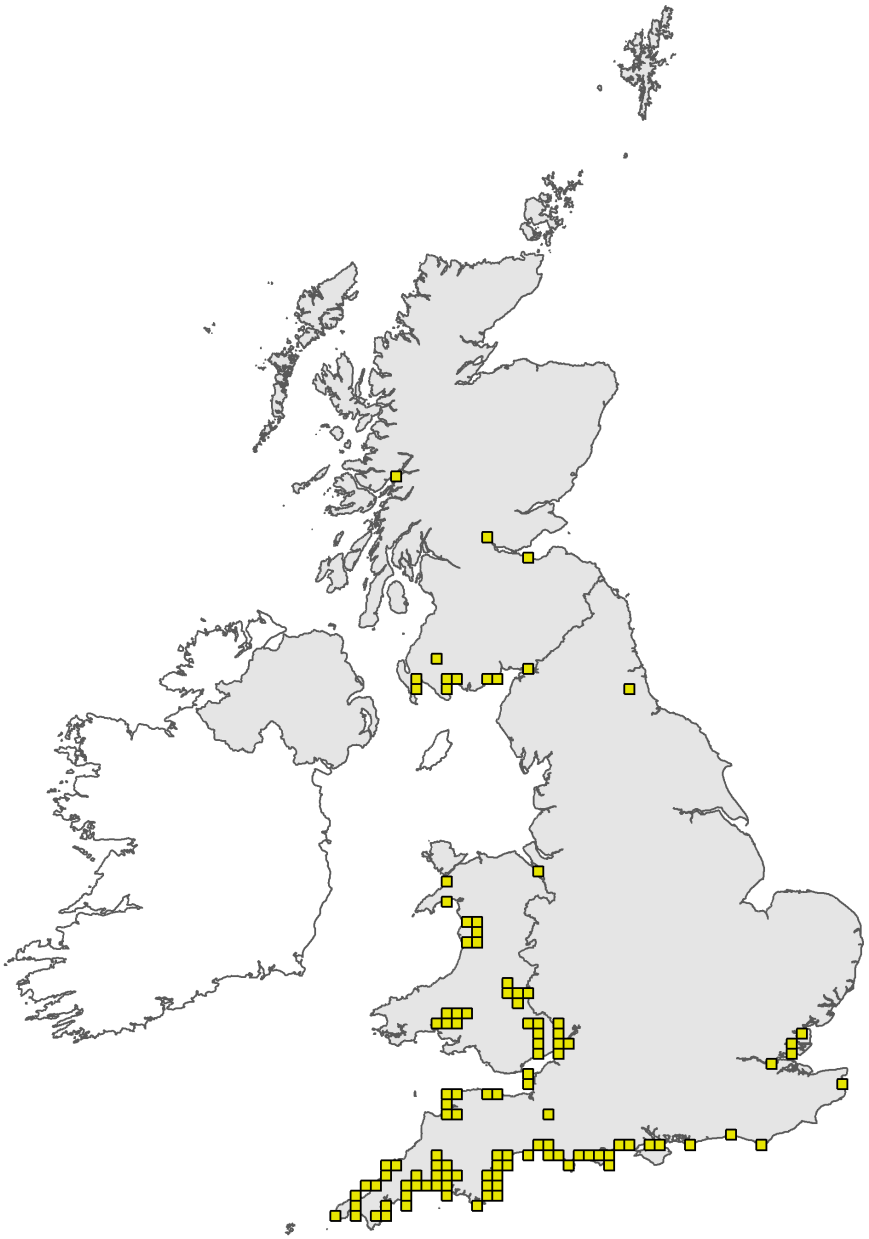

Figure 1: UK distribution map for S1103 - Twaite shad (*Alosa fallax*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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

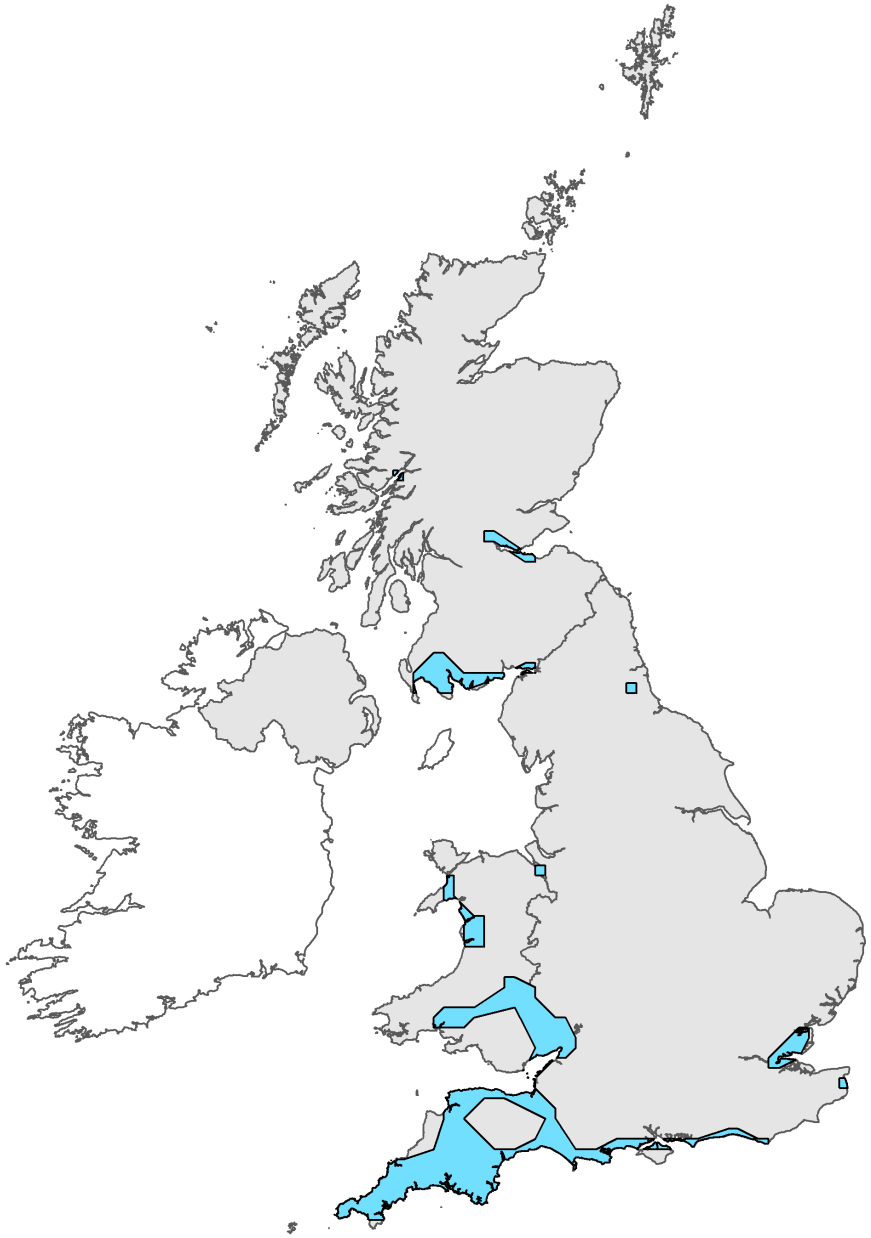

Figure 2: UK range map for S1103 - Twaite shad (*Alosa fallax*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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	Shads are the only anadromous members of the herring family found in British freshwaters; two species plus their hybrid are found around Scotland; the allis shad (Alosa alosa (L.)) and the twaite shad (Alosa fallax (Lacepede 1803)). Both species are declining across their full European range (Maitland & Lyle 2001). There are no known spawning sites for allis shad in Britain (Maitland & Hatton-Ellis 2003) but both sub-adults and sexually mature adults are regularly found in the Solway Firth (Maitland & Lyle 1991 & 1995). Only one possible breeding population of twaite shad is known from Scotland; that which is thought to spawn in the estuary of the River Cree (Maitland & Lyle 1995). Genetic studies suggest that allis shad have evolved from twaite shad (Alexandrino & Boisneau 2000), and (probably fertile) hybrids are common in the Solway Firth (Maitland & Hatton-Ellis 2003). The Solway shad are of particular interest because hybridisation between the two species has been confirmed there by both morphological and molecular techniques (Jolly et al. 2011 & 2012). Although isolated records have been obtained for shad from further afield, there is no evidence that these fish which have originated from Scotland or other parts of the UK or Europe. Publications- Information on the general distribution of shad around Scotland is readily available (e.g. Maitland (2007) and references therein), but data are rare in the primary literature. Some information is available in the grey literature in the form of data gathered by coastal netsmen in the Solway Firth, although that fishery has now ceased. Additional data was gathered from the The Marine Scotland Science Rare Fish Database, NBN and a recent SNH study (SLR Consulting, 2018) recovered 71 more recent records from Marine Scotland and the Scottish network of District Salmon Fishery Boards and Fishery Trusts in addition to those reported in the last Article 17 report. In the absence of structured, targeted surveys for shad species in and around Scotland, the datasets available represent opportunistic snapshots of distribution. Data quality - the two species and their hybrids are not easily distinguished, so the veracity of some of the records could be open to question. Only Alosa spp. data that could be positively identified as being Twaite shad (Allosa fallax) have been used to map the distribution of this speecies in Scotland and all records which could not be identified to species have been removed during this reporting round.

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

Field label	Note
6.2 Population size	Having data on individuals over a long time period would be needed to establish a robust assessment of population size. However, no specific surveys have been carried out and there is no measure of effort to go along with the numbers of incidental records obtained by various sources (e.g. NBN, Gallow Fisheries Trust, Marine Scotland Science rare Fish Database and grey literature). The number of occupied 1x1km grid squares for this species over the period 1990-2017 is 8. This can be seen as the minimum number of squares occupied by this species in Scottish coastal and estuarine waters.
6.15 Favourable reference population	Unable to calculate an FRV for Scotland based on the limited data available.

7.2 Sufficiency of area and quality of occupied habitat; Method used	The 2014 State of the Environment Report for Scotland (https://www.environment.gov.scot/our-environment/state-of-the-environment/2014-state-of-the-environment-report/) concluded that 97% of Scotland's 48,000 km2 of coastal waters are in good or high condition, the remaining 3% being classified as moderate (https://www.environment.gov.scot/media/1174/water-coastal-waters.pdf). Over 50% of the estuarine habitats, which are also used by this species, are considered to be in good condition, with a further 33% being classified as being at high status (https://www.environment.gov.scot/media/1175/water-estuaries.pdf) - despite some estuaries being impacted by presures such as nutrient enrichment and morphological change (e.g. sea walls, land claim etc.). In freshwater the most recent assessment points towards improved water quality and plans are in place, through WFD River Basin Management Plans to improve these further. Currently just less than 50% are classified as being at good or high status (https://www.environment.gov.scot/media/1179/water-rivers-and-canals.pdf). Therefore the quality and quantity of habitat for Twaite shad is considered to be adequate and quality is improving.
7.9 Additional information	Habitat quality and quantity appears unchanged from pervious reporting cycle. There are no historical spawning records for Allis or Twaite shad in Scotland, although they are occasionally captured in Scottish estuarine and coastal areas.Neither of which have changed in distribution or extent.
8.1 Characterisation of pressures/ threats	There are no extant fisheries for this species in Scotland, so exploitation is not included as a pressure. Key issues are climate change and habitat quality. This is already covered in S. 7.2.
9.1 Status of measures	Significant work, in terms of estaurine and marine water quality are underway to fulfil the obligations of the WFD which benefit Twaite shad. None of these measures are being carried out specifically for this species, although they may benefit from them.
9.6 Additional information	No specific conservation measures are required in Scotland, beyond ensuring that habitat quality remains suitable for this species, and that access to these riverine and estuarine habitats is assured. This species is protected under Schedule 5 of the Wildlife & Countryside Act 1981 (as amended).
10.2 Additional information	Continuing improvements to water quality (in rivers and coastal waters) and the removal of in-river barriers suggest that the prospects for shad is improving. However, this must be viewed light of the fact that shad have never spawned in Scottish waters.