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:

S1106 - Atlantic salmon (*Salmo salar*)

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	**1106**
1.3 Species scientific name	**Salmo salar**
1.4 Alternative species scientific name	
1.5 Common name (in national language)	Atlantic salmon

2. Maps

2.1 Sensitive species	No
2.2 Year or period	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?		Yes
3.2 Which of the measures in Art. 14 have been taken?	a) regulations regarding access to property	Yes
	b) temporary or local prohibition of the taking of specimens in the wild and exploitation	Yes
	c) regulation of the periods and/or methods of taking specimens	Yes
	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	Yes
	g) breeding in captivity of animal species as well as artificial propagation of plant species	Yes
	h) other measures	Yes

Prohibition on mixed stock coastal netting (already in place in Scotland and now extended to include Northumbrian netting stations), development of Conservation Limits (and annual river-by-river exploitation levels set on probability of achieving these). These were implemented through The Conservation of Salmon (Scotland) Regulations 2016. The implementation of new closed seasons/temproal restrictions to protect vulnerable life history types (such as the Spring multi-sea-winter stock component). These were implemented under The Conservation of Salmon (Annual Close Times and Catch and Release) (Scotland) Regulations 2014. Voluntary Catch & Release continues to be operated in most rivers for all other Atlantic salmon stock components (and can be mandatory in rivers which are designated as Grade 3 (unlikley to

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acheive their conservation limits) in any given year.

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)						7300
Max. (raw, ie. not rounded)						
Unknown	Yes	Yes	Yes	Yes	Yes	No

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

Complete survey or a statistically robust estimate

3.5. Additional information

Atlantic salmon catch statistics have been collected since 1952 (for rods and nets). The provision of annual catch returns is now mandatory under the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. The exploitation of Atlantic salmon in Scotland is now tightly regulated, through statutory measures. These include a restriction on exploitation on a weekly basis (no fishing allowed on a Sunday) and annual close times (no salmon are allowed to be killed before 1 April each year - although catch and release is allowed). This is primarly focussed on the need to protect the vulnerable (spring) stock component and is enshrined in Scotsh law through The Conservation of Salmon (Annual Close Time and Catch and Release) (Scotland) Regulations 2014. In addition to this, The Conservation of Salmon (Scotland) Regulations 2016 outlined for the first time in Scotland a system whereby the killing of Atlantic salmon in inland waters is managed on an annual basis by categorising the conservation status of their stocks.These regulations: 1) prohibit the retention of salmon caught in coastal waters; permit the killing of salmon within inland waters where stocks were above a defined conservation limit i.e. those rivers accorded category 1 or 2 status for the 2016 fishing season and each season since these regulations were introduced through an annual amendment of the Regularion; and require the mandatory catch and release of salmon in areas which fell below their defined conservation limit following the assessment of salmon stocks i.e. those rivers accorded category 3 status for the 2016 and subsequent seasons. Category 1 rivers are those which have at least an 80% probability of meeting their Conservation Limit, Category 2 (60-80%) and Category 3 (less than 60%). The most recent categorisations for scottish rivers, including the 17 rivers which include Atlantic salmon as a conservation feature can be found in The Conservation of Salmon (Amendment) Scotland Regulations 2018. The most recent categorisations for scottish rivers, including the 17 rivers which include Atlantic salmon as a conservation feature can be found in The Conservation of Salmon (Amendment) Scotland Regulations 2018. The most recent Conservation Limit categorisations for Atlantic salmon SACs are: Grade 1 - River Dee SAC; River Naver SAC; River Oykel SAC, River Spey SAC; River Tay SAC; River Thurso; River Tweed SAC. Grade 2 - River Borgie; Langavat SAC; River South Esk SAC. Grade 3 - Berriedale & Langwell Rivers SAC; River

Bladnoch SAC; Endrick Water SAC; River Moriston SAC. For Grade 1 rivers exploitation by rod is considered to be sustainable therefore no additional management action is currently required. This recognises the effectiveness of existing non-statutory local management interventions. For Grade 2 rivers management action is necessary to reduce exploitation; mandatory catch and release will not be required in the first instance, but this will be reviewed annually. For Grade 3 rivers exploitation is unsustainable therefore management actions required to reduce exploitation for 1 year i.e. mandatory catch and release (all methods).

BIOGEOGRAPHICAL LEVEL

4. Biogeographical and marine regions

4.1 Biogeographical or marine region where the species occurs

Atlantic (ATL)

4.2 Sources of information

Anon 2009. EU-UK (Scotland): Focus Area Report on Protection, Restoration and Enhancement of Salmon Habitat. NASCO Focus Area Report on Habitat, IP(09)8.
Beaver Salmonid Working Group 2015. Final Report of the Beaver Salmonid Working Group (prepared for The National Species Reintroduction Forum, Inverness).
Gardiner R & Egglishaw H 1986. A Map of the Distribution in Scottish Rivers of the Atlantic Salmon, Salmo salar L., pp. 5 + folded map. Department of Agriculture and Fisheries for Scotland, Freshwater Fisheries Laboratory, Pitlochry.
ICES 2018. Report of the Working Group on North Atlantic Salmon (WGNAS). 4-13 April 2018, Woods Hole, MA, USA. ICES CM 2018/ACOM:21
Jackson FL, Fryer RJ, Hannah, DM, Millar CP & Malcolm IA 2018. A spatio-temporal statistical model of maximum daily river temperatures to inform the management of Scotland's Atlantic salmon rivers under climate change. Science of The Total Environment, 612, 1543-1558.
Jonsson B & Jonsson N 2011. Ecology of Atlantic Salmon and Brown Trout: Habitat as a Template for Life Histories (Springer Netherlands, Dordrecht, the Netherlands).
Millidine KJ, Fryer RJ, Jackson FL, Glover RS, & Malcolm IA 2018. Site locations for the National Electrofishing Programme for Scotland (NEPS) and west coast SAC rivers (2018). DOI: 10.7489/12112-1
NEPS (2018) National Electrofishing Programme for Scotland. https://www.gov.scot/Resource/0053/00538332.pdf
Thorstad EB & Finstad B 2018. Impacts of salmon lice emanating from salmon farms on wild Atlantic salmon and sea trout. NINA Report 1449: 1-22.
Windsor ML, Hutchinson P, Petter Hansen L & Reddin DG 2012. Atlantic salmon at sea: findings from recent research and their implications for management. North Atlantic Salmon Conservation Organization document CNL 12(60).
Todd CD, Hughes SL, Marshall CT, MacLean JC, Lonergan ME & Biuw EM 2008. Detrimental effects of recent ocean surface warming on growth condition of Atlantic salmon. Global Change Biology, 14, 958-970.
Verspoor E., Stadmeyer L. & Nielsen J. 2007. The Atlantic Salmon: Genetics, Conservation and Management. Blackwell Publishing Ltd.
Crozier W., Whelan K., Buoro M., Chaput G., Daniels J., Grant S., Hyatt K., Irvine J., OMaoileidigh N., Prevost E., Rivot E., Russell I., Schmidt M. & Wells B. 2018. Atlantic salmon mortality at sea: Developing an evidence-based Likely Suspects

Framework. AST Blue Book based on a workshop held in Edinburgh 6-8 November 2017.
Godfrey JD., Stewart DC., Middlenas SJ. & Armstrong JD. 2015. Depth use and migratory behaviour of homing Atlantic salmon (Salmo salar) in Scottish coastal waters. ICES Journal of Marine Science, 72, 568-575.
ICES 2017. Report of the Working Group on North Atlantic salmon (WGNAS), 29 March- 7 April 2017, Copenhagen, Denmark. ICES CM 2017/ACOM:20. http://ices.dk/sites/pub/Publication Reports/Expert Group Report/acom/2017/WGNAS/wgnas_2017.pdf
2010 Marine Scotland Review of salmon catches https://www2.gov.scot/Publications/2011/09/salmon2010/Q/pno/3
2011 Marine Scotland Review of salmon catches https://www.gov.scot/publications/salmon-fishery-statistics-2011-season/
2012 Marine Scotland Review of salmon catches https://www.gov.scot/publications/salmon-fishery-statistics-2012-season/pages/2/
2013 Marine Scotland Review of salmon catches https://www.gov.scot/publications/salmon-fishery-statistics-2013-season/pages/2/)
2014 Marine Scotland Review of salmon catches https://www.gov.scot/publications/salmon-fishery-statistics-2014-season/pages/2/
2015 Marine Scotland Review of salmon catches https://www.gov.scot/publications/salmon-fishery-statistics-2015-season/pages/2/
2016 Marine Scotland Review of salmon catches https://www.gov.scot/publications/salmon-fishery-statistics-2016-season/pages/2/
2017 Marine Scotland Review of salmon catches https://www.gov.scot/publications/salmon-fishery-statistics-2017-season/
Map source acknowledgement: Salmon rivers CEH & SG Marine Scotland (2017). Based on digital spatial data licenced from the Centre for Ecology and Hydrology (C) NERC.

5. Range

5.1 Surface area (km²)		
5.2 Short-term trend Period		
5.3 Short-term trend Direction	Increasing (+)	
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	

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5.11 Change and reason for change in surface area of range	Genuine change Improved knowledge/more accurate data The change is mainly due to:	 Genuine change
5.12 Additional information		

6. Population

6.1 Year or period	2007-2017	
6.2 Population size (in reporting unit)	a) Unit b) Minimum c) Maximum d) Best single value	number of map 1x1 km grid cells (grids1x1) 15197
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	number of adults (adults) 484348
6.5 Type of estimate	Minimum	
6.6 Population size Method used	Based mainly on extrapolation from a limited amount of data	
6.7 Short-term trend Period	2005-2017	
6.8 Short-term trend Direction	Decreasing (-)	
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	1994-2017	
6.12 Long-term trend Direction	Uncertain (u)	
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	Genuine change The change is mainly due to:	 Genuine change

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6.17 Additional information	Adult population trend data is based on rod catch with no measure of effort. These data show that the spring stock component continues to decline. For other stock components the number of indiviuals captured shows significant interannual variation. Since 2010 We can see that after a period a high abundance in 2010 (highest since 1952), 2011 (6th highest) and relatively high abundance in 2012 catches (overall) catches declined sharply in 2013 (lowest) and 2014 (2nd lowest). Some recovery took place in 2015 and 2016 (though still only 69% and 80% of the previous 5-year average). Overall catches declined again in 2017 with the 4th lowest catch on record. The Spring stock component (multi sea-winter fish taken before 1 May) remained at historically low levels over this period. Grilse catches are reported to have increased over the early portion of this period (2011, 2012, 2013), although there are now growing concerns over the number of returning grilse, these are some (local) concerns over the size and condition of many of these fish.Marine Scotland Science carried out Spearman correlations for the two time periods (long term: 1994-2017; short term: 2005-2017). Over the long term (1994-2017) there is a positive correlation between year and MSW spawners, and a negative correlation between year and 1SW (grilse) for the whole of Scotland. There is no correlation between year and all ages of salmon (Spearman Rank long-term data: 1SW -0.596*; MSW 0.767* All salmon 0.045). On the shorter timescale the negative correlation between year and 1SW (grilse) spawners is seen, but in contrast with the longer data set there is no correlation between year and MSW numbers, and a negative relationship between year and all ages of Atlantic salmon (Spearman Rank long-term: 1SW -0.835*; MSW 0.143, All salmon 0.592*). With regard to different stock components there are still concerns over spring stocks (e.g. statutory catch and release until the end of March) and growing concerns over the decline in the numbers of grilse returning throughout Scotland. (*denotes significance at the 5% level).

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)?	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	Complete survey or a statistically robust estimate	
7.3 Short-term trend Period	2006-2018	
7.4 Short-term trend Direction	Increasing (+)	
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	Subsequent to historic declines, there have been recolonisations of various, formerly occupied industrialised rivers, such as the River Clyde and several Firth of Forth rivers in central Scotland. Identification of a clear range trend over this period is difficult. However, the gradual recolonisation of the Clyde catchment and other rivers and the removal of man-made barriers to migration in many	

catchments have undoubtedly led to an increase in habitat availability over the last two decades. Atlantic salmon are present in approximately 389 river systems in Scotland. The Marine Scotland Science salmon distribution dataset contains the best available information on the current distribution of salmon, and natural and man made passable and impassable barriers. This has been updated by an additional SEPA barriers dataset and includes information on barriers which have been either eased or removed to facilitate the movement of fish and restore river connectivity. Data were initially collated from a variety of historical and contemporary data sources including MSS staff, District Salmon Fishery Boards, Fisheries Trusts and local angling clubs in the 1980s (Gardiner & Egglishaw 1986). The last major update to the dataset was carried out in 2006. At this stage, the distribution data were digitised onto the Centre for Ecology and Hydrology (CEH) digital rivers network to identify the spatial distribution of salmon. The distribution of Atlantic salmon in Scotland was recently reviewed as part of the NASCO Focus Area Report (IP(09)8) and used during the last cycle of Article 17 reports. Juvenile electrofishing data are not currently
used to assess the status of salmon stocks at a national level because until 2018 there was no strategic, statistically designed national electrofishing programme. The National Electrofishing Programme for Scotland (NEPS) (Millidine et al., 2018) revisited the distribution of Atlantic salmon in Scotland to develop a randomised sampling strategy to assess the satus of juvenile Atlantic salmon in Scotland and the results of this first national survey are expected in 2019.

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 pollution to surface or ground waters (B23)	M
Management of fishing stocks and game (G08)	H
Introduction and spread of species (including GMOs) in marine aquaculture (G17)	H
Introduction and spread of species (including alien species and GMOs) in freshwater aquaculture (G24)	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
Desynchronisation of biological / ecological processes due to climate change (N06)	M

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 pollution to surface or ground waters (B23)	M
Management of fishing stocks and game (G08)	H
Introduction and spread of species (including GMOs) in marine aquaculture (G17)	H
Introduction and spread of species (including alien species and GMOs) in freshwater aquaculture (G24)	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
Desynchronisation of biological / ecological processes due to climate change (N06)	M

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		Maintain the current range, population and/or habitat for the species
9.3 Location of the measures taken		Both inside and outside Natura 2000
9.4 Response to the measures		Short-term results (within the current reporting period, 2013-2018)

9.5 List of main conservation measures

Reduce impact of hydropower operation and infrastructure (CC04)
Management of professional/commercial fishing (including shellfish and seaweed harvesting) (CG01)
Management of hunting, recreational fishing and recreational or commercial harvesting or collection of plants (CG02)
Reducing the impact of (re-) stocking for fishing and hunting, of artificial feeding and predator control (CG03)
Early detection and rapid eradication of invasive alien species of Union concern (CI01)
Management, control or eradication of other invasive alien species (CI03)
Management of problematic native species (CI05)
Reduce impact of multi-purpose hydrological changes (CJ02)
Adopt climate change mitigation measures (CN01)
Implement climate change adaptation measures (CN02)

9.6 Additional information

Atlantic salmon catch statistics have been collected since 1952 (for rods and nets). The provision of annual catch returns is now mandatory under the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. The exploitation of

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Atlantic salmon in Scotland is now tightly regulated, through staturory measures. These include a restriction on exploitation on a weekly basis (no fishing allowed on a Sunday) and annual close times (no salmon are allowed to be killed before 1 April each year - although catch and release is allowed). This is primarly focussed on the need to protect the vulnerable (spring) stock component and is enshrined in Scotsh law through The Conservation of Salmon (Annual Close Time and Catch and Release) (Scotland) Regulations 2014. In addition to this, The Conservation of Salmon (Scotland) Regulations 2016 outlined for the first time in Scotland a system whereby the killing of Atlantic salmon in inland waters is managed on an annual basis by categorising the conservation status of their stocks.These regulations: 1) prohibit the retention of salmon caught in coastal waters; permit the killing of salmon within inland waters where stocks were above a defined conservation limit i.e. those rivers accorded category 1 or 2 status for the 2016 fishing season and each season since these regulations were introduced through an annual amendment of the Regularion; and require the mandatory catch and release of salmon in areas which fell below their defined conservation limit following the assessment of salmon stocks i.e. those rivers accorded category 3 status for the 2016 and subsequent seasons. Category 1 rivers are those which have at least an 80% porobability of meeting their Conservation Limit, Category 2 (60-80%) and Category 3 (less than 60%). The most recent categorisations for scottish rivers, including the 17 rivers which include Atlantic salmon as a conservation feature can be found in The Conservation of Salmon (Amendment) Scotland Regulations 2018. The most recent categorisations for scottish rivers, including the 17 rivers which include Atlantic salmon as a conservation feature can be found in The Conservation of Salmon (Amendment) Scotland Regulations 2018. The most recent Conservation Limit categorisations for Atlantic salmon SACs are: Grade 1 - River Dee SAC; River Naver SAC; River Oykel SAC, River Spey SAC; River Tay SAC; River Thurso; River Tweed SAC. Grade 2 - River Borgie; Langavat SAC; River South Esk SAC. Grade 3 - Berriedale & Langwell Rivers SAC; River Bladnoch SAC; Endrick Water SAC; River Moriston SAC. For Grade 1 rivers exploitation by rod is considered to be sustainable therefore no additional management action is currently required. This recognises the effectiveness of existing non-statutory local management interventions. For Grade 2 rivers management action is necessary to reduce exploitation; mandatory catch and release will not be required in the first instance, but this will be reviewed annually. For Grade 3 rivers exploitation is unsustainable therefore management actions required to reduce exploitation for 1 year i.e. mandatory catch and release (all methods).

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

11.3. Habitat for the species

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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 adults (adults)
	b) Minimum	
	c) Maximum	
	d) Best single value	217116
12.2 Type of estimate	Multi-year mean	
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	Decreasing (-)	
12.5 Short-term trend of population size within the network Method used	Complete survey or a statistically robust estimate	
12.6 Additional information	271,116 repersents the average number of spawners in Atlantic salmon SACs in Scotland over the period 2012-2017 (in each year of this period the total number of spawners accounted for between 60-65% of the Scottish total). This is based on data collected and supplied by Marine Scotland Science. After a period a high abundance in 2010 (highest since 1952), 2011 (6th highest) and relatively high abundance in 2012 catches (overall) catches declined sharply in 2013 (lowest) and 2014 (2nd lowest). Some recovery took place in 2015 and 2016 (though still only 69% and 80% of the previous 5-year average). Overall catches declined again in 2017 with the 4th lowest catch on record. The Spring stock component (multi sea-winter fish taken before 1 May) remained at historically low levels over this period. Grilse catches are reported to have increased over the early portion of this period (2011, 2012, 2013) but there is growing concern over the numbers of returning grilse. Marine Scotland Science carried out Spearman correlations for the two time periods (long term: 1994-2017; short term: 2005-2017). While the patterns are slightly complex it is clear that the SACs spawner numbers in Atlantic salmon SACs reflect those of the whole of Scotland. Over the long term (1994-2017) there is a positive correlation between year and MSW	

spawners, and a negative correlation between year and 1SW (grilse) fish in SACs. There is no correlation between year and all ages of salmon (Spearman Rank long-term: 1SW -0.612*; MSW 0.781* All salmon 0.093). On the shorter timescale the negative correlation between year and 1SW (grilse) spawners is seen, but in contrast with the longer data set there is no correlation between year and MSW numbers, and a negative relationship between year and all ages of Atlantic salmon (Spearman Rank long-term: 1SW -0.791*; MSW 0.176, All salmon 0.566*). With regard to different stock components there are still concerns over spring stocks (e.g. statutory catch and release until the end of March) and growing concerns over the decline in the numbers of grilse returning - this extends throughout Scotland, both within and outwith the Atlantic salmon SAC series. (*denotes significance at the 5% level).

13. Complementary information

13.1 Justification of % thresholds for trends

13.2 Trans-boundary assessment

13.3 Other relevant Information

Distribution Map

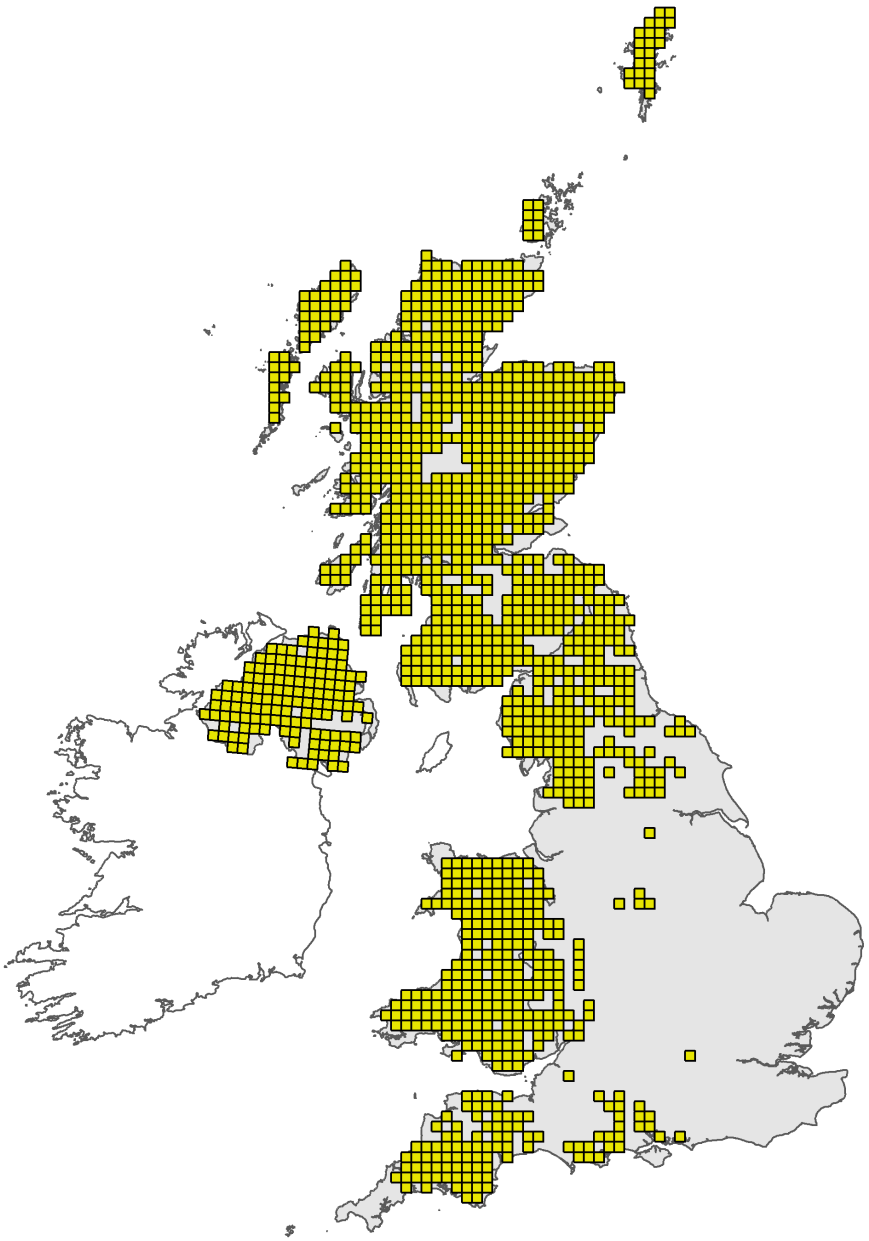

Figure 1: UK distribution map for S1106 - Atlantic salmon (*Salmo salar*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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

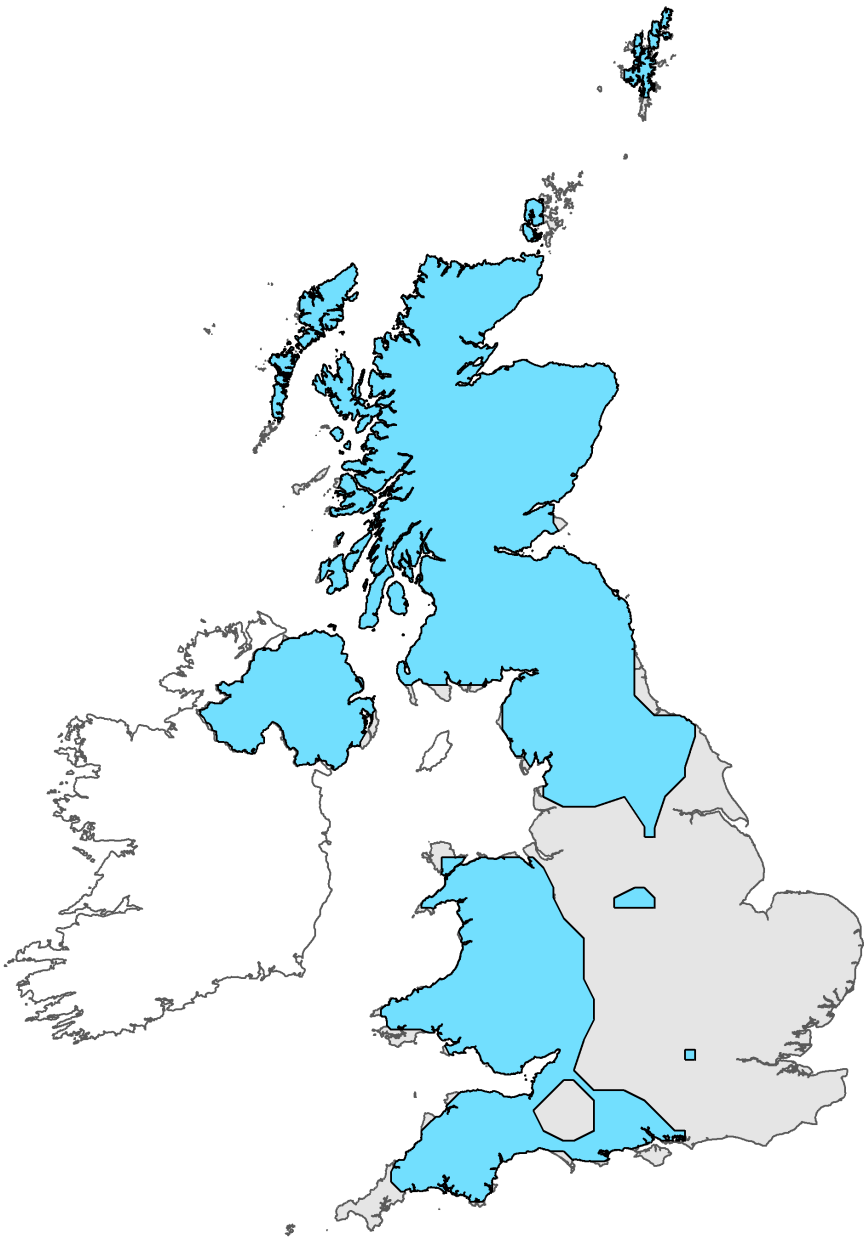

Figure 2: UK range map for S1106 - Atlantic salmon (*Salmo salar*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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: Salmo salar (1106)

Field label	Note
2.2 Year or Period	2018 is given as the date because this is the latest assessment of salmon distribution available. It provides more up-to-date data thatn Gardiner & Egglishaw (1984), and the previous NASCO FAR Report used in the previous reporting round.
3.3 Hunting bag or quantity taken in the wild for Mammals and Acipenseridae (Fish)	The total rod catch for the 2017 season (the latest data available) show that the total reported rod catch (retained and released) of wild Atlantic salmon in Scotland was 49,444. Of these 5, 187 fish were killed and retained (44, 257 were released). The Conservation of Salmon (Scotland) Regulations 2016 prohibit the capture of fish in coastal nets, although local netting (net and coble and a scientific haaf net fishery) captured and killed a further 2,113 fish.
3.5 Additional information	Atlantic salmon catch statistics have been collected since 1952 (for rods and nets). The provision of annual catch returns is now mandatory under the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. The exploitation of Atlantic salmon in Scotland is now tightly regulated, through staturory measures. These include a restriction on exploitation on a weekly basis (no fishing allowed on a Sunday) and annual close times (no salmon are allowed to be killed before 1 April each year - although catch and release is allowed). This is primarly focussed on the need to protect the vulnerable (spring) stock component and is enshrined in Scotsh law through The Conservation of Salmon (Annual Close Time and Catch and Release) (Scotland) Regulations 2014. In addition to this, The Conservation of Salmon (Scotland) Regulations 2016 outlined for the first time in Scotland a system whereby the killing of Atlantic salmon in inland waters is managed on an annual basis by categorising the conservation status of their stocks.These regulations: 1) prohibit the retention of salmon caught in coastal waters; permit the killing of salmon within inland waters where stocks were above a defined conservation limit i.e. those rivers accorded category 1 or 2 status for the 2016 fishing season and each season since these regulations were introduced through an annual amendment of the Regularion; and require the mandatory catch and release of salmon in areas which fell below their defined conservation limit following the assessment of salmon stocks i.e. those rivers accorded category 3 status for the 2016 and subsequent seasons. Category 1 rivers are those which have at least an 80% porobability of meeting their Conservation Limit, Category 2 (60-80%) and Category 3 (less than 60%). The most recent categorisations for scottish rivers, including the 17 rivers which include Atlantic salmon as a conservation feature can be found in The Conservation of Salmon (Amendment) Scotland Regulations 2018. The most recent Conservation Limit categorisations for Atlantic salmon SACs are: Grade 1 - River Dee SAC; River Naver SAC; River Oykel SAC, River Spey SAC; River Tay SAC; River Thurso; River Tweed SAC. Grade 2 - River Borgie; Langavat SAC; River South Esk SAC. Grade 3 - Berriedale & Langwell Rivers SAC; River Bladnoch SAC; Endrick Water SAC; River Moriston SAC. For Grade 1 rivers exploitation by rod is considered to be sustainable therefore no additional management action is currently required. This recognises the effectiveness of existing non-statutory local management interventions. For Grade 2 rivers management action is necessary to reduce exploitation; mandatory catch and release will not be required in the first instance, but this will be reviewed annually. For Grade 3 rivers exploitation is unsustainable therefore management actions required to reduce exploitation for 1 year i.e. mandatory catch and release (all methods).

Species name: Salmo salar (1106) Region code: ATL

Field label	Note

5.3 Short term trend; Direction	Currently present in 799 10km squares and 15388 1 km squares (unpublished data from Marine Scotland Science). Subsequent to historic declines, there have been recolonisations of various, formerly occupied industrialised rivers, such as the River Clyde and several Firth of Forth rivers in central Scotland. Identification of a clear range trend over this period is difficult. However, the gradual recolonisation of the Clyde catchment and other rivers and the removal of man-made barriers to migration in many catchments have undoubtedly led to an increase in habitat availability in the shorter term. The scale of this over the shorter term appears to be larger than any losses in available habitat over this term. The short-term range should therefore be (+). Atlantic salmon are present in ~389 river systems in Scotland, encompassing 208.72 km2 of river habitat (length 87,461.99 km). A recent analysis (Buddendorf et al., submitted), underpinned by a national juvenile salmon density model (Malcolm et al., in press), has been used to assess the amount of river habitat (based on salmon fry production, river wetted area and river length), which is above man-made impassable barriers and inaccessible to salmon. Trends in accessibility have been considered by assessing the amount potential salmon fry production (plus wetted area and length) above barriers which have been removed or eased but are below any remaining impassable barriers. The percentage of potential salmon fry production nationally estimated to be above man-made impassable barriers is 2.61% (4,460,959 fish). This equates to 5.68% (11,851,434 m2) and 8.42% (7,365,245 m) of wetted area and river length respectively. As a result of 46 barrier removals (coded in the national barriers dataset) salmon fry production is estimated to have increased by 1.16% (1,990,312 fish). Accessible wetted area and length has increased by 1.48% (3,085,451 m2) and 1.46% (1,277,271 m2) respectively. Note that for this analysis rivers above natural impassable barriers and rivers in lochs have been excluded.
5.5 Short term trend; Method used	The method is based on a spatial data analysis (Buddendorf et al., submitted) underpinned by the national juvenile salmon density model (Malcolm et al., in press) using spatial datasets developed by Marine Scotland Science and the national barriers dataset maintained by SEPA.
6.4 Additional population size	Spawning adults based on a 10-year average value over the period 2007-2017 (484,348). These figures are the number of spawners - provided by Marine Scotland Science. They are therefore the best measure the numbers of fish which will contribute to future recruitment. Data quality is considered to be good. (Grilse 249,099; MSW 235,250 over the same 2007-2017 period).
7.1 Sufficiency of area and quality of occupied habitat	Atlantic salmon are present in ~389 river systems in Scotland, encompassing 208.72 km2 of river habitat (length 87,461.99 km). A recent analysis (Buddendorf et al., submitted), underpinned by a national juvenile salmon density model (Malcolm et al., in press), calculates the national production of Atlantic salmon fry in Scotland to be 171,003,138 individuals. The pre-fishery abundance of adult Atlantic salmon for 2017 (the latest year for which data is available) is 487,564 fish (226,665 grilse and 260,899 multi-sea-winter).

7.4 Short term trend; Direction	Atlantic salmon are present in ~389 river systems in Scotland, encompassing 208.72 km2 of river habitat (length 87,461.99 km). A recent analysis (Buddendorf et al., submitted), underpinned by a national juvenile salmon density model (Malcolm et al., in press), has been used to assess the amount of river habitat (based on salmon fry production, river wetted area and river length), which is above man-made impassable barriers and inaccessible to salmon. Trends in accessibility have been considered by assessing the amount potential salmon fry production (plus wetted area and length) above barriers which have been removed or eased but are below any remaining impassable barriers. The percentage of potential salmon fry production nationally estimated to be above man-made impassable barriers is 2.61% (4,460,959 fish). This equates to 5.68% (11,851,434 m2) and 8.42% (7,365,245 m) of wetted area and river length respectively. As a result of 46 barrier removals (coded in the national barriers dataset) salmon fry production is estimated to have increased by 1.16% (1,990,312 fish). Accessible wetted area and length has increased by 1.48% (3,085,451 m2) and 1.46% (1,277,271 m2) respectively. Note that for this analysis rivers above natural impassable barriers and rivers in lochs have been excluded.
7.5 Short term trend; Method used	The method is based on a spatial data analysis (Buddendorf et al., submitted) underpinned by the national juvenile salmon density model (Malcolm et al., in press) using spatial datasets developed by Marine Scotland Science and the national barriers dataset maintained by SEPA.
7.9 Additional information	Subsequent to historic declines, there have been recolonisations of various, formerly occupied industrialised rivers, such as the River Clyde and several Firth of Forth rivers in central Scotland. Identification of a clear range trend over this period is difficult. However, the gradual recolonisation of the Clyde catchment and other rivers and the removal of man-made barriers to migration in many catchments have undoubtedly led to an increase in habitat availability over the last two decades. Atlantic salmon are present in approximately 389 river systems in Scotland. The Marine Scotland Science salmon distribution dataset contains the best available information on the current distribution of salmon, and natural and man made passable and impassable barriers. This has been updated by an additional SEPA barriers dataset and includes information on barriers which have been either eased or removed to facilitate the movement of fish and restore river connectivity. Data were initially collated from a variety of historical and contemporary data sources including MSS staff, District Salmon Fishery Boards, Fisheries Trusts and local angling clubs in the 1980s (Gardiner & Egglishaw 1986). The last major update to the dataset was carried out in 2006. At this stage, the distribution data were digitised onto the Centre for Ecology and Hydrology (CEH) digital rivers network to identify the spatial distribution of salmon. The distribution of Atlantic salmon in Scotland was recently reviewed as part of the NASCO Focus Area Report (IP(09)8) and used during the last cycle of Article 17 reports. Juvenile electrofishing data are not currently used to assess the status of salmon stocks at a national level because until 2018 there was no strategic, statistically designed national electrofishing programme. The National Electrofishing Programme for Scotland (NEPS) (Millidine et al., 2018) revisited the distribution of Atlantic salmon in Scotland to develop a randomised sampling strategy to assess the satus of juvenile Atlantic salmon in Scotland and the results of this first national survey are expected in 2019.

8.1 Characterisation of pressures/ threats	A wide range of pressures can affect Atlantic salmon, both in freshwater and in marine environments. Intensive aquaculture, exploitation (as adults and as a pre-adult by-catch), climate change and predation (at a local scale) can all impact this species at sea and in coastal areas. Atlantic salmon support a large recreational fishery in Scotland, and a culture of 'catch and release' has grown in recent years. Stocking, carried out in support of these fisheries, continues to be a management issue in many catchments. This has, in part, been addressed by amendments made to the Salmon and Freshwater Fisheries (Consolidation)(Scotland) Act 2003 by the Aquaculture & Fisheries (Scotland) Acts of 2007 and 2013. Controls on exploitation (though the use of weekly and seasonal close times), restrictions placed on angling gear and bait, and provision for the control of the monogenean parasite Gyrodactylus salaris were also included in the 2007 Act and further controls on the aquaculture industry, recreational fisheries and fisheries governance were introduced in 2013. An attempt to reform and modernise fisheries management structures, initiated in 2014, has been abandoned although a system of exploitation management using annually updated Conservation Limits has been in place since 2016. The production of Salmon management Plans to support this approach has been agreed and a template for these is under development. The network of Fisheries Trusts which cover most of Scotland has also produced both Fishery Management Plans and Biosecurity Plans for each of their respective areas, although much othis may re-appear within the Salmon Management Plans mentioned above. These outline priorities for action at a local level. The Water Framework Directive has established a regulatory structure aimed at the protection, improvement and sustainable use of surface waters, transitional waters, coastal waters and ground-waters across Europe. Activities which impact aquatic habitats are tightly controlled through domestic legislation - Water Environment and Water Services (Scotland) Act 2003. Discharges, disposal to land, abstractions, impoundments and engineering works (such as those related to mineral extraction, hydro and in-river engineering) are all regulated by SEPA through the Water Environment (Controlled Activities) (Scotland) Regulations 2011. Marine renewables developments may pose a risk to Atlantic salmon and Marine Scotland Science have put in place research programme to identify the marine migration pathways of this specfies around Scotish (mainly east) coasts (e.g. Godfrey et al., 2015). Climate change will impact both freshwater and marine habitats. In freshwater changes to established hydrological regimes and the more frequent occurrence of extreme events can have significant impacts on Atlantic salmon and their habitats. At sea, changes to prey productivity as a result of changing temperatures, pH and, possibly currents, may already be impacting migrating Atlantic salmon. These are outwith the direct control of the Scottish (or UK) government. Reviews of the factors affecting Atlantic salmon in freshwater and at sea can be found in Verspoor et al. (2007), Jonsson & Jonsson (2011) and Crozier et al. (2018).

8.3 Additional information

Marine survival is a key issue for Atlantic salmon and this is influenced by a number of factors, such as: marine predation, marine parasites and disease, by-catch in pelagic fisheries, exploitation by salmon fisheries and food availability and growth (e.g. Todd et al., 2008; Anon, 2009; Jonsson & Jonsson, 2012; Windsor et al. 2012). The influence of climate change is still poorly understood, but it is likely influence the magnitude and influence of these factors and temperature may be a significant issue in its own right. The most recent published percentage survival (% return to homewaters prior to coastal fisheries) data available (ICES, 2018) for Scottish 1 Sea Winter smolts from the North Esk index site suggest that 7.5% of these fish survive, with a 10yr average of 5.92 fish. The figure for Multi Sea Winter fish is smaller, with only 4% of fish returning, with a 10yr average of 5.33%. The role and extent of coastal marine aquaculture impacts on Atlantic salmon through the transmission of above natural levels of sea lice (Lepeophtheirus salmonis) and genetic introgression from escaped fish is contested by the wild fisheries sector and aquaculture producers, although there is an extensive, and growing, literature on the subject (see Thorstad & Finstad 2018 for a recent review). Mortality levels, caused by sea lice have been estimated to vary between 1% (Jackson et al., 2013) to 50% in high lice years (Shephard & Gargan, 2017) in Ireland. The Norwegian Scientific Advisory Committee for Atlantic Salmon have accepted that 10% of the pre-fishery abundance is lost to sea lice infestation (Forseth &Finstad, 2018). No comparable figure exists for the west coast of Scotland where this industry is situated.The Scottish Parliament is currently undertaking a review into the aquaculture sector. The abiotic factors affecting Atlanttic salmon in freshwater were previously summarised in the NASCO Focus Area report on Habitat (Anon, 2009) and these have not changed. Water quality in Scotland is generally good and action is determined by lists of measures contained in the two River Basin Management Plans which cover Scotland to bring all WFD waterbodies up to good condition. Works continue to address point and diffuse pollution sources from agricultural, forestry, industrial and domestic sources. Considerable effort and resource has gon into addressing issues such as controlling abstraction for industrial and power production, as well as improving connectivity within rivers by easing or removing barriers to migration. Predator control is a continuing issue, principally the control of piscivorous birds, such as goosanders and to a lesser extent cormorants. Sea predation may also pose additional pressures in some areas. Predation is controlled by a licensing system operated by SNH. The re-introduction of European beaver to Scotland has caused some concern amongst wild fishery stakeholders and farmers. The Final report of the Beaver Salmonid Working Group (2015) provides an overview of the key issues, and management approaches are currently being developed by SNH. Exploitation of adult fish, both by coastal mixed stock nets and anglers has undertaken significant regulatory change since the last reporting cycle. The provision of annual catch returns is now mandatory under the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. The exploitation of Atlantic salmon in Scotland is now tightly regulated, through staturory measures. These include a restriction on exploitation on a weekly basis (no fishing allowed on a Sunday) and annual close times (no salmon are allowed to be killed before 1 April each year - although catch and release is allowed). This is primarly focussed on the need to protect the vulnerable (spring) stock component and is enshrined in Scots law through The Conservation of Salmon (Annual Close Time and Catch and Release) (Scotland) Regulations 2014. In addition to this, The Conservation of Salmon (Scotland) Regulations 2016 outlined for the first time in Scotland a system whereby the killing of Atlantic salmon in inland waters is managed on an annual basis by categorising the conservation status of their stocks.These regulations: 1) prohibit the retention of salmon caught in coastal waters; permit the killing of salmon within inland waters where stocks were above a defined conservation limit i.e. those rivers accorded category 1 or 2 status for the 2016 fishing season and each season since these regulations were introduced through an annual amendment of the Regularion; and require the mandatory catch and release of salmon in areas which fell below their

	defined conservation limit following the assessment of salmon stocks i.e. those rivers accorded category 3 status for the 2016 and subsequent seasons. Category 1 rivers are those which have at least an 80% porobability of meeting their Conservation Limit, Category 2 (60-80%) and Category 3 (less than 60%). The most recent categorisations for scottish rivers, including the 17 rivers which include Atlantic salmon as a conservation feature can be found in The Conservation of Salmon (Amendment) Scotland Regulations 2018. The most recent categorisations for scottish rivers, including the 17 rivers which include Atlantic salmon as a conservation feature can be found in The Conservation of Salmon (Amendment) Scotland Regulations 2018. Outwith Scotland, the North East England (Northumbrian) drift and T&J nets which intercept Atlantic salmon bound for Scottish rivers (including east coast SACs) are being phased out in 2019. The T&J nets will remain open for sea trout only. Climate change is an increasingly important issue for Atlantic salmon in Scotland in terms of increasing temperatures, potential phenological impacts and the increased probability of flood and drought events. Recent work by Marine Scotland to develop a river temperature model to predict the maximum daily river temperatures and sensitivity to climate change throughout Scotland as been completed (see Jackson et al., 2018) and this presents the opportunity to develop a strategic approach to tackling this issue at a local level to protect vulnerable Atlantic salmon habitats.
9.5 List of main conservation measures	Atlantic salmon are an SAC species whilst in freshwater only and face a range of problems both in freshwater, but also at sea. The current approach (10 max conservation measures and only five as high priority) does not allow the full range of issues to be addressed. Water quality is generally good for Atlantic salmon in Scotland, but one may also have included CA10, CA11 and CB14 to cover point sourse and diffuse water quality issues to be addressed. CG09 and CG14 would also have allowed issues relating to marine and freshwater aquaculture to be included (both sea lice in marine environments, and fish farm escapes from both marine and freshwater installations). CG05 could have been included to cover the issue of by-catch, an activity which is considered to lead to the mortality of Atlantic salmon post-smolts at sea. these presures have been idenitfied in a number of publications - including the NASCO FAR Report which was produced prior to the last reporting cycle. This is included in the Species Sources section.

9.6 Additional information	Atlantic salmon catch statistics have been collected since 1952 (for rods and nets). The provision of annual catch returns is now mandatory under the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. The exploitation of Atlantic salmon in Scotland is now tightly regulated, through staturory measures. These include a restriction on exploitation on a weekly basis (no fishing allowed on a Sunday) and annual close times (no salmon are allowed to be killed before 1 April each year - although catch and release is allowed). This is primarly focussed on the need to protect the vulnerable (spring) stock component and is enshrined in Scotsh law through The Conservation of Salmon (Annual Close Time and Catch and Release) (Scotland) Regulations 2014. In addition to this, The Conservation of Salmon (Scotland) Regulations 2016 outlined for the first time in Scotland a system whereby the killing of Atlantic salmon in inland waters is managed on an annual basis by categorising the conservation status of their stocks.These regulations: 1) prohibit the retention of salmon caught in coastal waters; permit the killing of salmon within inland waters where stocks were above a defined conservation limit i.e. those rivers accorded category 1 or 2 status for the 2016 fishing season and each season since these regulations were introduced through an annual amendment of the Regularion; and require the mandatory catch and release of salmon in areas which fell below their defined conservation limit following the assessment of salmon stocks i.e. those rivers accorded category 3 status for the 2016 and subsequent seasons. Category 1 rivers are those which have at least an 80% porobability of meeting their Conservation Limit, Category 2 (60-80%) and Category 3 (less than 60%). The most recent categorisations for scottish rivers, including the 17 rivers which include Atlantic salmon as a conservation feature can be found in The Conservation of Salmon (Amendment) Scotland Regulations 2018. The most recent categorisations for scottish rivers, including the 17 rivers which include Atlantic salmon as a conservation feature can be found in The Conservation of Salmon (Amendment) Scotland Regulations 2018. The most recent Conservation Limit categorisations for Atlantic salmon SACs are: Grade 1 - River Dee SAC; River Naver SAC; River Oykel SAC, River Spey SAC; River Tay SAC; River Thurso; River Tweed SAC. Grade 2 - River Borgie; Langavat SAC; River South Esk SAC. Grade 3 - Berriedale & Langwell Rivers SAC; River Bladnoch SAC; Endrick Water SAC; River Moriston SAC. For Grade 1 rivers exploitation by rod is considered to be sustainable therefore no additional management action is currently required. This recognises the effectiveness of existing non-statutory local management interventions. For Grade 2 rivers management action is necessary to reduce exploitation; mandatory catch and release will not be required in the first instance, but this will be reviewed annually. For Grade 3 rivers exploitation is unsustainable therefore management actions required to reduce exploitation for 1 year i.e. mandatory catch and release (all methods).

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10.2 Additional information	The pre-fishery abundance of Atlantic salmon (in all areas of its global range) has declines significantly over the last 40 years from 8-10 million fish in the 1980s to approximately 3-4 million fish (ICES 2017) and this decline is being felt in Scotland as well as elsewhere. Measures to reduce rod and net exploitation have been introduced by the Scottish Government for vulnerable stock components and for salmon more generally. In freshwaters, measures are in place to improve water quality and increase the amount of habitat available for fish production through the removal of in-stream barriers. Atlantic salmon abundance, as measured by rod catch and netting returns for 218 rivers from 1952 show the interannual variability which may exists between year and between locations. The total reported rod catch of Atlantic salmon (grilse and MSW fish) in 2017 was 49,444 fish which was 80% of the previous five-year average. It is also the fourth lowest on record.Overall catch of salmon and grilse in later months, on the other hand, generally increased up to 2010, after which it fell sharply over the next 4 years before recovering slightly in 2015 and 2016 only to fall again in 2017. Trends in rod catch varied among individual stock components. Reported catch of spring salmon has generally declined since records began and, although there is some indication that catch has stabilised in recent years, it remains at a historically low level.