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:

S6353 - Whitefish (*Coregonus lavaretus*)

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.

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NATIONAL LEVEL

1. General information

1.1 Member State	**UK (Scotland information only)**
1.2 Species code	**6353**
1.3 Species scientific name	**Coregonus lavaretus Complex**
1.4 Alternative species scientific name	
1.5 Common name (in national language)	Whitefish

2. Maps

2.1 Sensitive species	No
2.2 Year or period	2017-
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)						0
Unknown	No	No	No	No	No	No

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

Based mainly on expert opinion with very limited data

3.5. Additional information

No commercial or sporting (recreational) fishery exists for this ecies in Scotland. Occasional reports of angler caught fish are received, although these fish, protected under Shedule 5 of the Wildlfe & Coutryside Act 1981, are returned.

BIOGEOGRAPHICAL LEVEL

4. Biogeographical and marine regions

4.1 Biogeographical or marine region where the species occurs

Atlantic (ATL)

4.2 Sources of information

Adams CE, Bean CW, Down A, Dodd JA, Etheridge EC, Gowans ARD, Hooker O, Knudsen R, Lyle AA, Maitland PS, Winfield IJ & Praebel K 2016. Inter and intra-population phenotypic and genotypic structuring in the European whitefish, Coregonus lavaretus, a rare freshwater fish in Scotland. Journal of Fish Biology 88, 580-594.

Adams CE, Winfield IJ & Lyle AA 2017. Assessing the status of powan in the wider countryside of Scotland for Article 17 Reporting, 2017. Report to Scottish Natural Heritage

Bean, CW 2003. A standardised survey and monitoring protocol for the assessment of whitefish, Coregonus albula (L.) and C. lavaretus (L.), populations in the UK. Joint Nature Conservation Committee, Peterborough 43pp.

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.

Etheridge, E. 2009 Aspects of the Conservation Biology of Coregonus lavaretus in Britain. Unpublished PhD Thesis, University of Glasgow.

Etheridge EC, Adams CE, Bean CW, Durie NC, Gowans AR Harrod C, Lyle AA, Maitland PS & Winfield IJ 2012. Are phenotypic traits useful for differentiating among a priori Coregonus taxa?. Journal of Fish Biology 80, 387-407.

Etheridge EC, Bean CW, Maitland PS, Ballantyne S & Adams CE 2012. Discontinuous infra-specific variation in ecological and morpohological traits have consequences for conservation of powan (Coregonus lavaretus) in Scotland. Advances in Limnology 63, 505-517.

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Hume JB, Adams CE, Bean CW & Maitland PS (2013) Evidence of a recent decline in lamprey parasitism of an indigenous whitefish Coregonus lavaretus in Loch Lomond, Scotland: is there a diamond in the ruffe?. J. Fish Biol. 82, 1708-1716.
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. Wiley & Sons Publ. Ltd. 639pp.
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 2007. Scotland's Freshwater Fish: Ecology, Conservation & Folklore. Trafford Publishing, Oxford.
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.
Winfield IJ, Fletcher JM & Cragg-Hine D. 1994. Status of Rare Fish: A Literature Review of Freshwater Fish in the UK. National Rivers Authority R&D Report No. 18, 58pp.
Winfield IJ, Adams CE & Fletcher JM 1996. Recent introductions of the ruffe (Gymnocephalus cernuus) to three United Kingdom lakes containing Coregonus species. Annales Zoologici Fennici 33, 459-466.
Winfield IJ, Fletcher JM, & James JB 2005. SCM of fish in Loch Eck. Final Report. Report to Scottish Natural Heritage. LA/C02852/1. 22 pp.
Winfield IJ, Fletcher JM & James JB 2005. SCM of fish in standing waters (Phase II). Final Report. Report to Scottish Natural Heritage. LA/C02256/4. 40 pp.
Winfield IJ, Fletcher JM, James BJ, Duigan CA, Bean CW & Durie NC 2007. Long-term case histories of ruffe (Gymnocephalus cernuus) introductions to four U.K. lakes containing native vendace (Coregonus albula) or whitefish (C. lavaretus) populations. Advances in Limnology 60, 301-309.
Winfield IJ, Bean CW, Gorst J, Gowans ARD, Robinson M & Thomas R 2013. Assessment and conservation of whitefish (Coregonus lavaretus) in the U.K. Advances in Limnology 64, 301-317.
Winfield IJ & James JB 2017. Site Condition Monitoring of Arctic charr and Powan at 4 SSSIs in Scotland 2016-2018. Report to Scottish Natural Heritage.
Winfield, I.J & Fletcher, J.M. (2008) Hydroacoustic assessment of the introduced powan populations of Carron Valley Reservoir and Loch Sloy. Report to Scottish Natural Heritage.

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

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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	Genuine change The change is mainly due to:	Genuine change
5.12 Additional information	Favourable reference status must be the surface area of the two original sites - sites which are still occupied by whitefish in Scotland, Loch Lomond and Loch Eck (74.98 km2). The area occupied by whitefish in Scotland has increased by an additional 9.55 km2 through the establishment of six additional refuge populations. This gives a total occupancy of 84.53 km2.	

6. Population

6.1 Year or period	2017	
6.2 Population size (in reporting unit)	a) Unit	number of individuals (i)
	b) Minimum	29661
	c) Maximum	157025
	d) Best single value	63222
6.3 Type of estimate	Best estimate	
6.4 Additional population size (using population unit other than reporting unit)	a) Unit	number of map 1x1 km grid cells (grids1x1)
	b) Minimum	
	c) Maximum	
	d) Best single value	187
6.5 Type of estimate	Best estimate	
6.6 Population size Method used	Complete survey or a statistically robust estimate	
6.7 Short-term trend Period	1998-2017	
6.8 Short-term trend Direction	Increasing (+)	
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	1988-2017	
6.12 Long-term trend Direction	Increasing (+)	

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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
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)?	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	2005-2017	
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	There are no long-term changes to the distibution of habitats occupied by native populations of whitefish - the two native populations of this species in Scotland (Loch Lomond and Loch Eck) remain extant and the area covered by these waterbodies has not changed. New populations of whitefish have been established at six locations since 1988 - Loch Sloy, Carron Valley Reservoir, Locan Shira, Allt na Lairige Reservoir, Loch Tarsan and Loch Glashan.	

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

Land, water and air transport activities generating pollution to surface or ground waters (E05)	M
Management of fishing stocks and game (G08)	H
Introduction and spread of species (including alien species and GMOs) in freshwater aquaculture (G24)	H
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 pollution to surface or ground waters (B23)	M
Land, water and air transport activities generating pollution to surface or ground waters (E05)	M
Management of fishing stocks and game (G08)	H
Introduction and spread of species (including alien species and GMOs) in freshwater aquaculture (G24)	H
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?	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		Only 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/eliminate point pollution to surface or ground waters from agricultural activities (CA10)
Reduce diffuse pollution to surface or ground waters from agricultural activities (CA11)

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Reduce impact of hydropower operation and infrastructure (CC04)

Reducing the impact of (re-) stocking for fishing and hunting, of artificial feeding and predator control (CG03)

Control/eradication of illegal killing, fishing and harvesting (CG04)

Early detection and rapid eradication of invasive alien species of Union concern (CI01)

Management, control or eradication of established invasive alien species of Union concern (CI02)

Management, control or eradication of other invasive alien species (CI03)

Adopt climate change mitigation measures (CN01)

Reinforce populations of species from the directives (CS01)

Improvement of habitat of species from the directives (CS03)

9.6 Additional information

Whitefish are present in lochs Lomond and Eck and healthy populations remain there. the introduction of ruffe to Loch Lomond (first found in 1982) presents a significant risk to the whitefish population there but it is currently absent from Loch Eck. Since 1988 whitefish have been established in six refuge sites, four of which used Loch Lomond to source its donor population. Further spread of ruffe and other non-native species (both nnon-native to the UK or to individual catchments/waterbodies) to new sites is now regulated by the Salmon and Freshwater Fish (Scotland) Act 2003. Water quality and the overall aquatic environment are protected through WFD-led domestic legislation. Whitefish are protected under Schedule 5 of the Wildlife & Countryside Act 1981 (as amended)

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

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

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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 b) Minimum c) Maximum d) Best single value
12.2 Type of estimate	
12.3 Population size inside the network Method used	
12.4 Short-term trend of population size within the network Direction	
12.5 Short-term trend of population size within the network Method used	
12.6 Additional information	

13. Complementary information

13.1 Justification of % thresholds for trends	
13.2 Trans-boundary assessment	No relevant
13.3 Other relevant Information	

Distribution Map

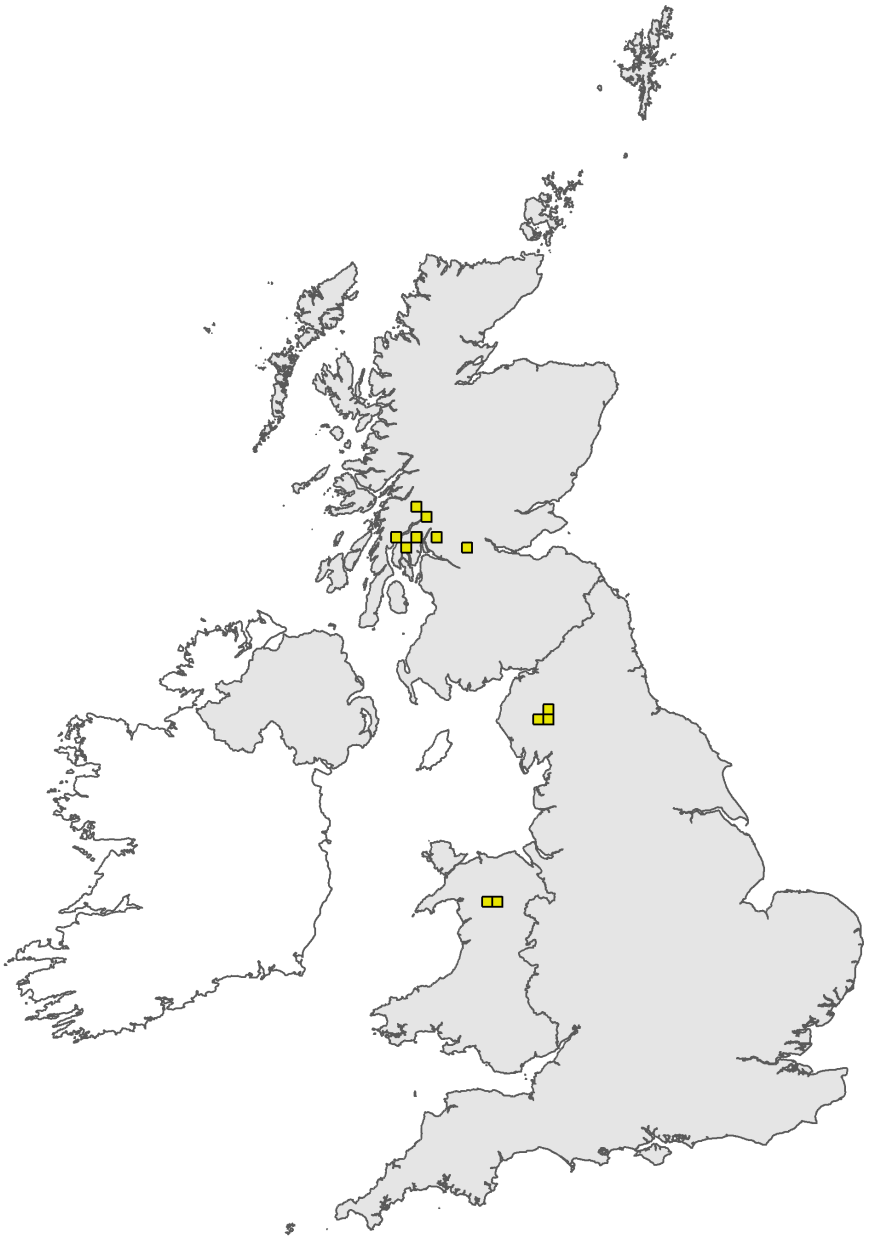

Figure 1: UK distribution map for S6353 - Whitefish (*Coregonus lavaretus*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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

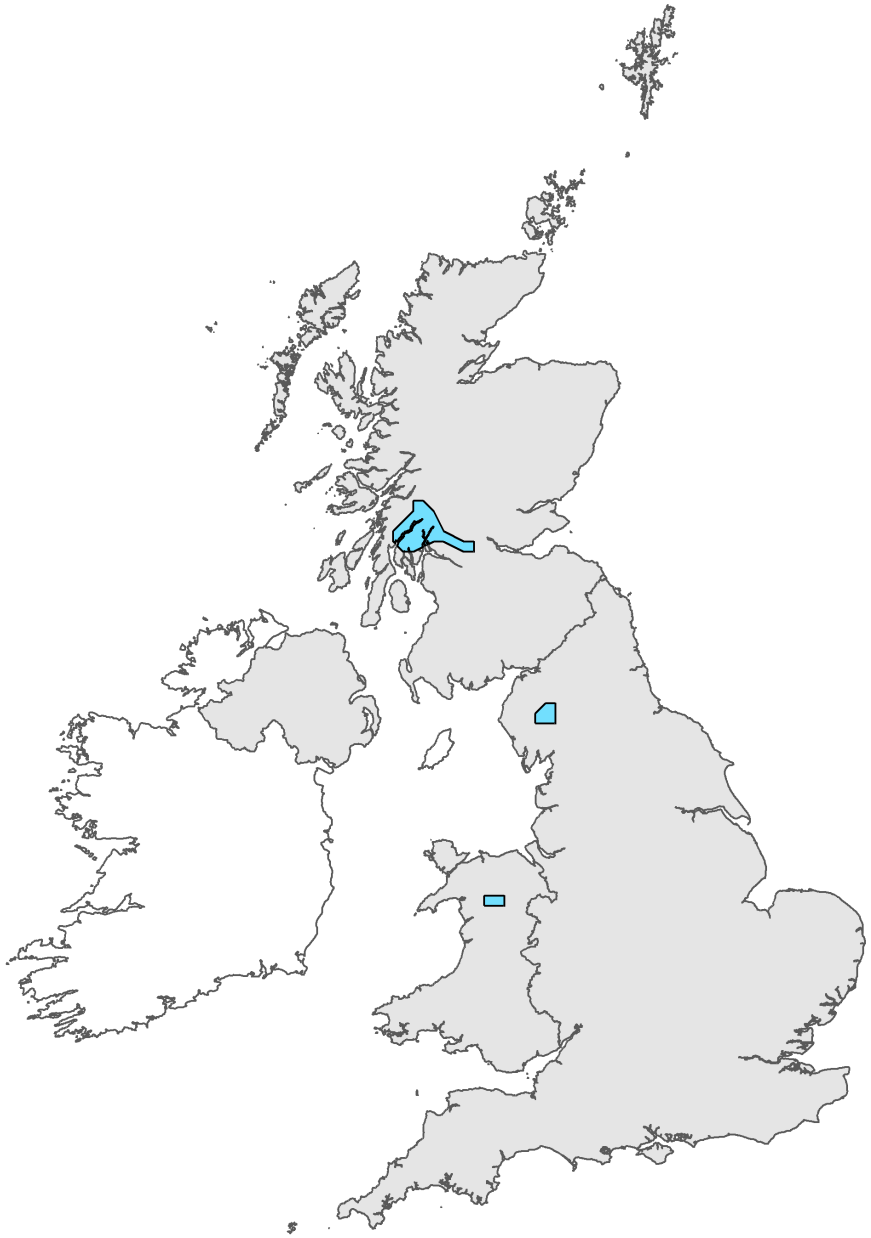

Figure 2: UK range map for S6353 - Whitefish (*Coregonus lavaretus*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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: Coregonus lavaretus Complex (6353)

Field label	Note
2.4 Distribution map; Method used	Native populations of whitefish (known as Powan in Scotland, Schelly in England and Gwyniad in Wales) only known from two waterbodies in Scotland - lochs Eck and Lomond. New populations were established in Carron Valley Reservoir and Loch Sloy during 1988-1990 using fish sourced from Loch Lomond. More recently, new populations have been established in Lochan Shira (2009 and 2010) and Allt na Lairige Reservoir (2009 and 2010) using Loch Lomond stock and Loch Tarsan (2010 and 2011) and Loch Glashan (2010 and 2011) using fish sourced from Loch Eck. Adams et al., (2014) provide details of the life stages and numbers of fish used to establish all of these translocated populations.
3.5 Additional information	No commercial or sporting (recreational) fishery exists for this species in Scotland. Occasional reports of angler caught fish are received, although these fish, protected under Shedule 5 of the Wildlfe & Coutryside Act 1981, are returned.

Species name: Coregonus lavaretus Complex (6353) Region code: ATL

Field label	Note
5.3 Short term trend; Direction	In the last reporting cycle whitefish were present in four sites (two native populations in Loch Lomond and Loch Eck, and two introduced in Carron Valley Reservoir and Loch Sloy). Since that time, four new populations have been established (Lochan Shira, Allt no Lairige Reservoir, Loch Tarsan and Loch Glashan). Population surveys, using the methodology described in bean (2003) suggest that the trend in terms of range is therefore increasing - but this is for introduced whitefish populations - the native population range remains stable and unchanged.
6.2 Population size	Based on actual survey (Adams et al., 2017; Winfield & James, 2016; Winfield & Fletcher, 2008). Hudroacoustics (fish density) data were available for all sites with the exception of Loch Sloy. Although this site was sampled to confirm that whitefish were still present in 2017, population data from Winfield & Fletcher (2008) have been used to provide an estimate of abundance.
6.8 Short term trend; Direction	The population trend is increasing; this trend is based on the number of populations in Scotland. This is a species with high interannual variability in number of individuals; single, one-off, surveys which report the actual number of individuals may not give a true representation of the population trend.
7.9 Additional information	There are no long-term changes to the distibution of habitats occupied by native populations of whitefish - the two native populations of this species in Scotland (Loch Lomond and Loch Eck) remain extant and the area covered by these waterbodies has not changed. New populations of whitefish have been established at six locations since 1988 - Loch Sloy, Carron Valley Reservoir, Locan Shira, Allt na Lairige Reservoir, Loch Tarsan and Loch Glashan.

8.1 Characterisation of pressures/ threats	C. lavaretus (powan) is naturally extant in two waterbodies in Scotland (lochs Lomond and Eck), and six additional refuge sites have been established. Of these, only one site (Loch Lomond) is currently under threat from non-native species - the ruffe. Invasive fish and plant species could also be a risk within other lakes where this species is present (either naturally or introduced). Fish introductions are controlled under legislation (Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003). Water quality, particularly issues which lead to sedimentation in spawning substrates, could constitute a further risk to all populations, although it is not considered to be a current issue in any of the Scottish sites. Climate change is an issue which affects all native freshwater fish species in Scotland - particularly because freshwater fish may have little or no access to alternative habitats.
8.3 Additional information	The key pressures for whitefish are climate change, competition and predation by introduced species and habitat quality (influenced by climate, water quality, sedimentation), macrophyte encoachment into littoral spawning areas and water abstraction (e.g. drawdown at inappropriate times (such as spawning and incubabtion) in populations established in reservoirs).
9.6 Additional information	Whitefish are present in lochs Lomond and Eck and healthy populations remain there. the introduction of ruffe to Loch Lomond (first found in 1982) presents a significant risk to the whitefish population there but it is currently absent from Loch Eck. Since 1988 whitefish have been established in six refuge sites, four of which used Loch Lomond to source its donor population. Further spread of ruffe and other non-native species (both nnon-native to the UK or to individual catchments/waterbodies) to new sites is now regulated by the Salmon and Freshwater Fish (Scotland) Act 2003. Water quality and the overall aquatic environment are protected through WFD-led domestic legislation. Whitefish are protected under Schedule 5 of the Wildlife & Countryside Act 1981 (as amended).
10.2 Additional information	The future prospects for powan are good for Loch Eck, but less so for Loch Lomond which is under pressure from introduced ruffe. However, the establishment of six refuge populations provides some security for the species in Scotland as a whole. Where possible the Loch Lomond population should be protected, both directly and through maintenance of essential habitats.