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:

S1109 - Grayling (*Thymallus thymallus*)

WALES

IMPORTANT NOTE - PLEASE READ

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

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

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

NATIONAL LEVEL

1. General information

1.1 Member State	**UK (Wales information only)**
1.2 Species code	**1109**
1.3 Species scientific name	**Thymallus thymallus**
1.4 Alternative species scientific name	
1.5 Common name (in national language)	Grayling

2. Maps

2.1 Sensitive species	No
2.2 Year or period	1998-2018
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?	Yes	
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

Cove RJ. 2007 National Grayling Anglers' Logbook Scheme Angler Report 2006/07. Environment Agency National Fisheries Technical Team Report. Environment Agency, Buckley.
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Duigan C, Monteith DT, Carvalho L, Bennion H, Hutchinson J, Seda JM, Evans F. 2003 The current ecological and conservation status of Llyn Tegid. In: Llyn Tegid Symposium: The ecology, conservation and environmental history of the largest natural lake in Wales. Eds. Duigan C, Gritten R, Millband H). University of Liverpool, Liverpool.
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Sciences, Bangor University.
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Bathers K. 2018. Dee catch returns from Hanak International Grayling Festival. Unpublished catch data. River Dee.
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NRW 2018. Dee Stock Assessment Programme. Natural Resources Wales.
NRW 2017. National Fisheries Populations Database. Natural Resources Wales.
NBN 2018. Database for the Atlas of Freshwater Fishes (online). Available from: https://nbn.org.uk/ (Accessed 26th January 2018). NBN 2018. Welsh Invertebrate Database (online). Available from: https://nbn.org.uk/ (Accessed 26th January 2018).
WUF 2018. Wye and Usk Foundation 'River Work'. Available from: https://www.wyeuskfoundation.org/Pages/Category/river-work. Accessed 8th May 2018.

5. Range

5.1 Surface area (km²)		
5.2 Short-term trend Period		
5.3 Short-term trend Direction	Stable (0)	
5.4 Short-term trend Magnitude	a) Minimum	b) Maximum
5.5 Short-term trend Method used		
5.6 Long-term trend Period		
5.7 Long-term trend Direction		
5.8 Long-term trend Magnitude	a) Minimum	b) Maximum
5.9 Long-term trend Method used		
5.10 Favourable reference range	a) Area (km²) b) Operator c) Unknown d) Method	
5.11 Change and reason for change in surface area of range	No change	

	The change is mainly due to:	
5.12 Additional information		

6. Population

6.1 Year or period	1988-2018	
6.2 Population size (in reporting unit)	a) Unit	number of map 1x1 km grid cells (grids1x1)
	b) Minimum	
	c) Maximum	
	d) Best single value	519
6.3 Type of estimate	Best estimate	
6.4 Additional population size (using population unit other than reporting unit)	a) Unit	
	b) Minimum	
	c) Maximum	
	d) Best single value	
6.5 Type of estimate		
6.6 Population size Method used	Based mainly on extrapolation from a limited amount of data	
6.7 Short-term trend Period	2007-2018	
6.8 Short-term trend Direction	Stable (0)	
6.9 Short-term trend Magnitude	a) Minimum	
	b) Maximum	
	c) Confidence interval	
6.10 Short-term trend Method used	Based mainly on extrapolation from a limited amount of data	
6.11 Long-term trend Period	1988-2013	
6.12 Long-term trend Direction	Stable (0)	
6.13 Long-term trend Magnitude	a) Minimum	
	b) Maximum	
	c) Confidence interval	
6.14 Long-term trend Method used	Based mainly on expert opinion with very limited data	
6.15 Favourable reference population (using the unit in 6.2 or 6.4)	a) Population size	
	b) Operator	
	c) Unknown	
	d) Method	
6.16 Change and reason for change in population size	Use of different method	
	The change is mainly due to:	Use of different method
6.17 Additional information		

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7. Habitat for the species

7.1 Sufficiency of area and quality of occupied habitat	a) Are area and quality of occupied habitat sufficient (to maintain the species at FCS)?	No
	b) Is there a sufficiently large area of occupied AND unoccupied habitat of suitable quality (to maintain the species at FCS)?	Yes
7.2 Sufficiency of area and quality of occupied habitat Method used	Complete survey or a statistically robust estimate	
7.3 Short-term trend Period	2013-2018	
7.4 Short-term trend Direction	Stable (0)	
7.5 Short-term trend Method used	Complete survey or a statistically robust estimate	
7.6 Long-term trend Period		
7.7 Long-term trend Direction		
7.8 Long-term trend Method used		
7.9 Additional information		

8. Main pressures and threats

8.1 Characterisation of pressures/threats

Pressure	Ranking
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	H
Temperature changes (e.g. rise of temperature & extremes) due to climate change (N01)	H
Physical alteration of water bodies (K05)	M
Modification of hydrological flow (K04)	M
Development and operation of dams (K03)	M
Problematic native species (I04)	M
Invasive alien species of Union concern (I01)	M

Threat	Ranking
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	M
Temperature changes (e.g. rise of temperature & extremes) due to climate change (N01)	H
Physical alteration of water bodies (K05)	H
Modification of hydrological flow (K04)	H
Invasive alien species of Union concern (I01)	M

8.2 Sources of information

8.3 Additional information

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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		
9.6 Additional information		

10. Future prospects

10.1 Future prospects of parameters	a) Range b) Population c) Habitat of the species
10.2 Additional information	

11. Conclusions

11.1. Range	
11.2. Population	
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

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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
13.3 Other relevant Information

Distribution Map

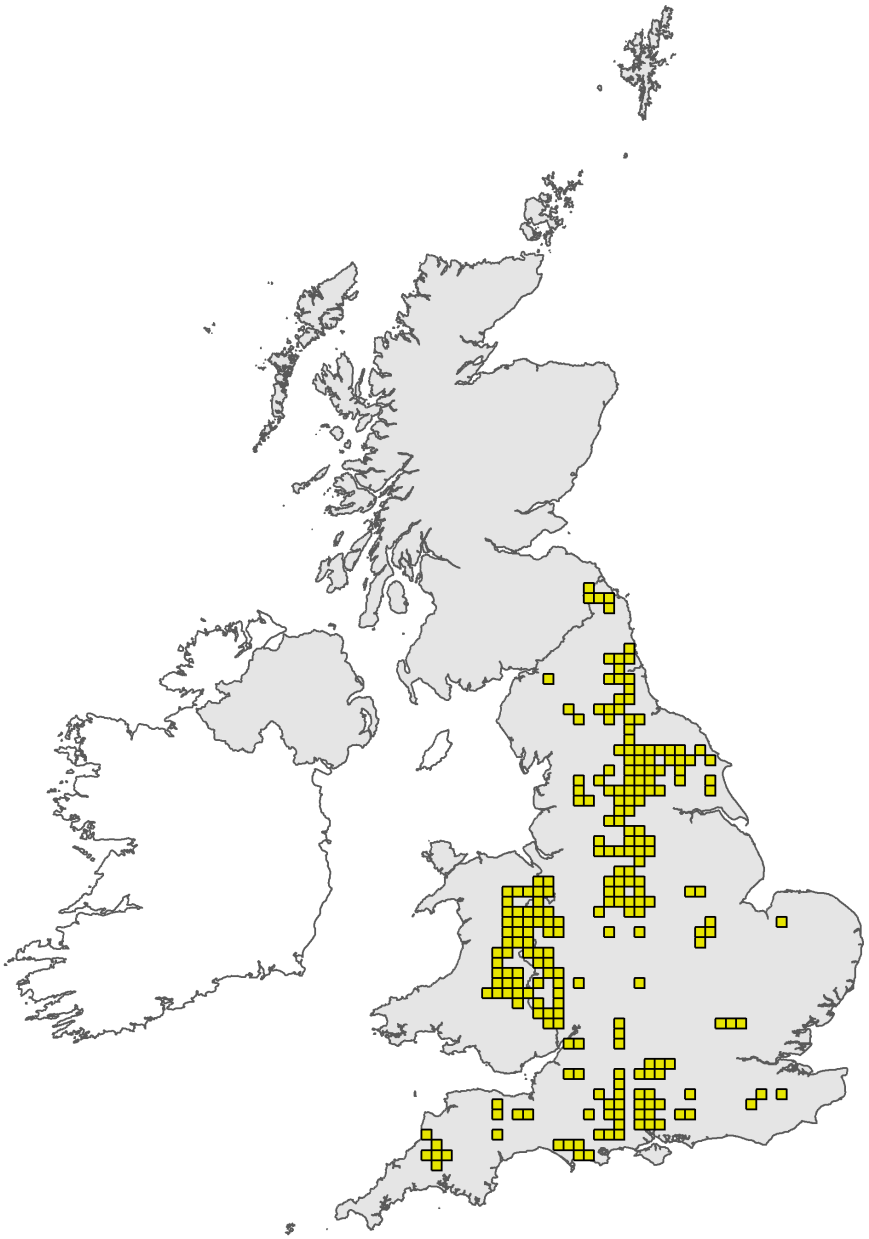

Figure 1: UK distribution map for S1109 - Grayling (*Thymallus thymallus*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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

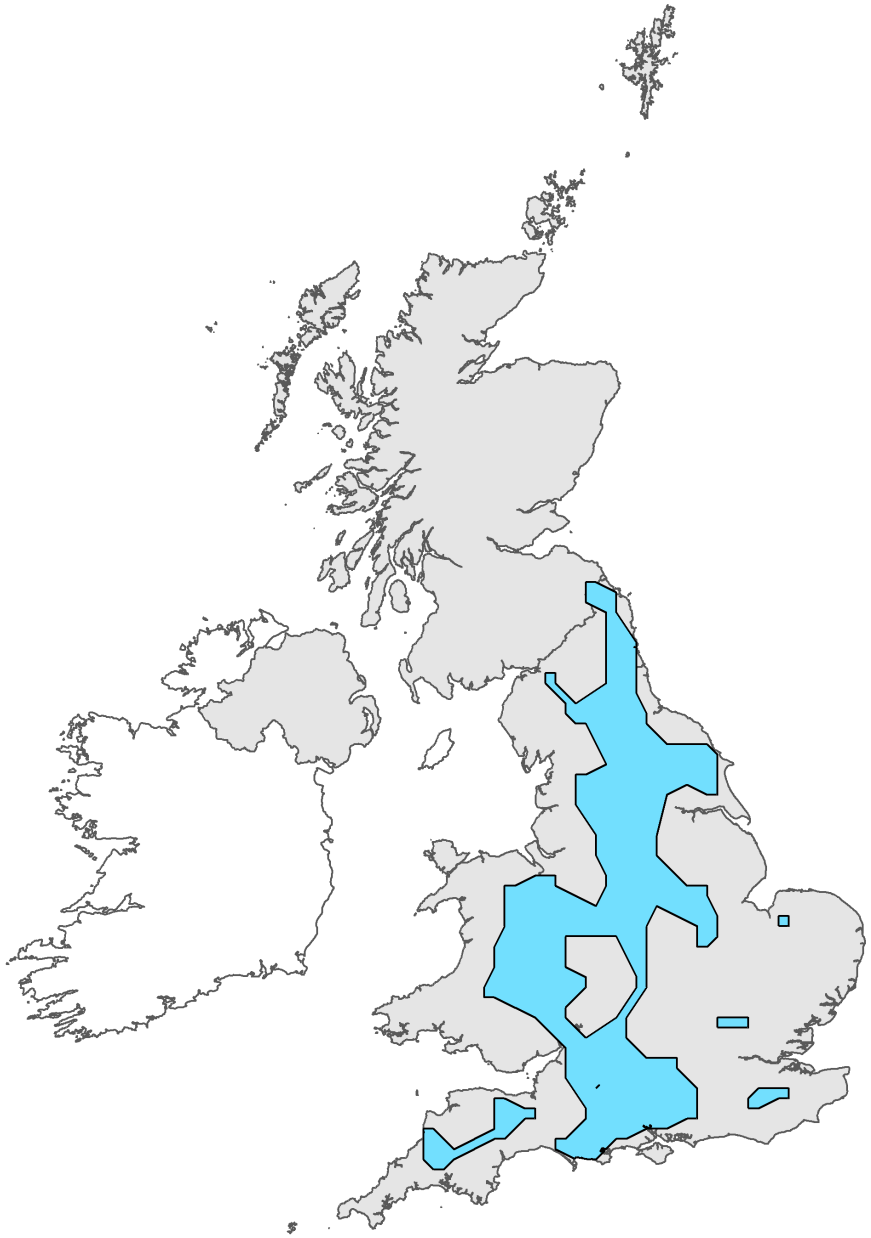

Figure 2: UK range map for S1109 - Grayling (*Thymallus thymallus*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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: Thymallus thymallus (1109)

Field label	Note
2.3 Distribution map	Although the required method only requires the number of squares to be calculated, this has been derived via a mapping exercise.
2.4 Distribution map; Method used	Grayling is a difficult species to electrofish and there is currently no specific survey scheme in place for grayling in Wales. The majority of data for the current cycle is based on catch returns from the Wye and Usk Foundation's website (WUF 2018), information from an annual grayling fishing competition held on the Dee (Bathers 2018) as well as several data points from Natural Resources Wales' Dee Stock Assessment Programme surveys on the Dee (5 minute fry electro fishing surveys). This provides a patchy 1km2 population map for 2013-2018 due to a lack of records from several tributaries on the Severn. However, it is known from anecdotal evidence and angling clubs that the distribution of grayling has remained constant over the last 20 years and therefore the 1km2 Favourable Reference Population map used in this report for grayling in Wales is based on data from 1998-2018. This includes data in Ibbotson et al. (2001), Cove (2007) and websites of angling clubs and rivers trusts. This has substantially improved the distribution of the species with various gaps being filled particularly in the tributaries of the Severn in mid Wales. The 10km2 distribution map used in this report is based directly on the FRP map.

Species name: Thymallus thymallus (1109) Region code: ATL

Field label	Note
6.2 Population size	This includes both 1km squares containing actual grayling records, and 1km squares in sections along the river network between actual records and where grayling are assumed to be present. The resulting count is a very good estimate of the extent of grayling populations in Wales. Previously grayling were assessed using 10km2 (NRW, 2013). An interagency paper (IAFG 2018) has agreed to standardise freshwater species methods in rivers, including grayling, using the EU reporting unit where available. For the purposes of UK level aggregration, the population counts for Wales reported to JNCC is the total count for Wales LESS any transboundary squares (value = 430). The transboundary square count (value = 89) is provided to NE for inclusion in their JNCC submission. The overall revised population value now constitutes the FRV population value for this species.
6.8 Short term trend; Direction	Between 2007-2012, using the same methods as above, 377 1km squares contained grayling. The difference in range is largely explained by the discontinuation of the national grayling anglers logbook scheme which is no longer undertaken due to resourcing issues. These differences are considered insignificant at a Wales level and the population is therefore considered stable.
6.9 Short term trend; Magnitude	No significant trend is apparent. No quantitative data are available on population trend. The apparent decrease in number of occupied squares is the result of a decrease in recording of grayling in Wales, rather than a real change.
6.10 Short term trend; Method used	Further technical work is required to establish a suitable technical method to assess grayling populations, using a standardised sampling method that can provide acceptable population estimates. It should be noted that even then, it may be difficult to confidently identify trends, as grayling populations vary naturally (Ibbotson et al. 2001). The above notwithstanding, the general consensus amongst both NRW fisheries staff (R. Cove pers com; P. Greest pers com) and rivers trusts (S. Marsh-Smith pers com) is that grayling populations are either stable or increasing.

6.12 Long term trend; Direction	No quantitative data are available on long-term trend, and grayling populations are notoriously variable (Ibbotson et al. 2001). Anecdotal evidence suggests that some grayling populations have expanded into the upper reaches of river systems as they recover from acidification, but also that fish eating birds may be affecting recruitment by predating juveniles. The relative importance of these pressures with respect to their impact on populations is unknown. In Wales the status of grayling in the Severn subcatchment is considered to be of most concern, as the grayling population there is more fragmented (Ibbotson et al. 2001). However despite this the long-term trend is still considered stable, based on a combination of expert opinion and limited data.
6.13 Long term trend; Magnitude	No reliable long term range trend data are available.
6.14 Long term trend; Method used	Further technical work is required to establish a suitable technical method to assess grayling populations, using a standardised sampling method that can provide acceptable population estimates. It should be noted that even then, it may be difficult to confidently identify trends, as grayling populations vary naturally (Ibbotson et al. 2001). The above notwithstanding, the general consensus amongst both Natural Resources Wales fisheries staff (R. Cove pers com; P. Greest pers com) and rivers trusts (S. Marsh-Smith pers com) is that grayling populations are broadly stable.
6.16 Change and reason for change in population size	Previously grayling were assessed using 10km2 (NRW, 2013).
6.17 Additional information	UNKNOWN if reproduction, mortality or age structure deviate from normal
7.1 Sufficiency of area and quality of occupied habitat	- area = YES Grayling are understood to mainly utilise cold, well oxygenated water and spawn in shallow redds in Spring. Whilst high oxygen levels appear important they are probably more sensitive to sediment levels and morphological quality than to water chemistry. - quality = NO Overall = NO b) If NO, is there a sufficiently large area of occupied & unoccupied habitat of suitable quality (to maintain the species at FCS)? - sufficient occupied = see 7.1a above - sufficient unoccupied = YES Overall = YES Across Wales they occupy 98 WFD river water bodies (c.1290km of habitat). Given the extent of such occupancy it is considered that there is currently sufficient area of occupied habitat to maintain the species. Whilst extent of current occupancy may be considered sufficient there remain issues centred on the quality of the currently utilised habitat. For example, the 2015 WFD classification indicates that 11% of waterbodies occupied by grayling were heavily modified, 16% were failing for chemical status and 8% were at poor status overall. Failing WFD elements included cadmium, copper, lead, zinc, macrophytes, invertebrates and fish. This indicates that grayling are able to occupy heavily modified systems with some water quality issues given suitable spawning areas. Given our current understanding of the ecological requirements of grayling, there remains 109 water bodies/942km of potentially suitable unoccupied habitat in Wales within their three native catchments. Current absence of the species from these areas is likely to be a combination of both morphological issues such as barriers and poor water quality. However, when combined with the currently occupied area the overall habitat is considered sufficient for long-term survival of the species in Wales.
7.2 Sufficiency of area and quality of occupied habitat; Method used	Water Framework Directive monitoring data provides a detailed and spatially widespread baseline, subject to the caveats regarding its ecological relevance noted under 7.1.
7.4 Short term trend; Direction	see 7.2 supporting narrative

8.1 Characterisation of pressures/ threats	Pressures: Water quality (J01) is a significant concern for grayling habitat in Wales and a larger pressure than modification to habitat. In the 2015 classifications, nearly 900km of river water body failed good ecological status due to the impact of WFD Annex 8 and/or Annex 10 substances, predominantly copper and zinc but to a lesser extent cadmium and pesticides. Riverine habitat structure particularly lack of bankside shading is the other major pressure on grayling due to the resulting elevated temperatures (N01). Other reductions in habitat structure and diversity which have negative impacts on grayling include removal of woody debris for flood control purposes reduces cover from predators such as fish eating birds, and promotes competition with other fish such as trout (Ibbotson et al. 2001). Grayling also require adequate riffle habitat for spawning, and pool habitat for fry development (K05). The range of grayling in Wales coincides with some of the most regulated river systems. 300km of grayling habitat was classified as Heavily Modified Water Body (HMWB), mostly due to the effects of flow regulation for public water supply. HMWBs supporting grayling did not have detectably worse ecological quality than non HMWBs, probably because public water supply reservoirs are predominantly situated in upland areas with good water quality and fewer agricultural impacts. Thus, large-scale river regulation does not seem to have a serious impact on grayling in Wales. In Llyn Tegid, the pattern of lake level management may have resulted in an increase in the grayling population. A more important issue may be the effect of smaller barriers to migration such as weirs and dams but there is little quantified information on the magnitude of these effects (K04, K03). Predation of fish, including grayling, by piscivorous birds is a highly contentious issue (I04). Piscivorous birds are highly mobile species that do not depend on a single food source outside the breeding season, hence there is the potential for them to have significant local impacts on fish populations. Two species, goosander Mergus merganser and cormorants Phalacrocorax carbo, have expanded their range into Wales in recent years and have increased in numbers, though national trends suggest their numbers are now levelling off. Several studies have indicated that fish-eating birds may affect the size and stability of grayling populations (see Ibbotson et al. 2001 for a summary). However, fish eating birds are an extremely conspicuous pressure and their true impact in comparison to other pressures may be exaggerated. Threats: The largest threat to grayling is warmer river temperatures caused by climate change (N01). Grayling are longer lived in colder water conditions for instance in the Dee, grayling mature at age 2-5 (Wooland 1972), compared to 1-2 years in southern England (Ibbotson et al. 2001). Temperature is also likely to affect the length of the growing season and spawning timing (Ibbotson et al. 2001). Invasive non-native species are a significant threat to Welsh freshwaters (I01). Their impacts are complex and species-specific, but since they may reach large densities they are likely to affect various species including grayling either through direct impacts or by modifications to the food chain. A particularly problematic species is likely to be signal crayfish, which is capable of predating grayling eggs and competing with it for food. Grayling are widely fished in Wales and are increasingly a valued target species, as evidenced by the anglers comments published on the WUF website (Wye & Usk foundation, 2012). As grayling are quite a delicate species, some mortality or stress may be caused by handling, thereby reducing lifespan (Ibbotson et al. 2001, G12). However, exploitation rates are very low in Wales with fewer than 1% of grayling caught by anglers killed (Cove, 2007). There are also national byelaws in place to protect grayling and the Grayling Society actively encourages catch-and-release (Grayling Society, 2018).

10.1 Future prospects of parameters	Despite the pressures and threats to grayling habitat, grayling numbers appear to be resilient in the three native catchments in Wales. This reflects the ability of grayling to withstand certain pressures and it is predicted that numbers will continue to remain stable over the next twelve years (unless key water temperature or quality thresholds are reached). However, there is a growing awareness of the need to improve both river habitat and land management. It is anticipated that positive works due to interventions by organisations including Natural Resources Wales and rivers trusts alongside positive policy changes will mitigate impacts of these pressures before they cause grayling numbers to decline. The two major pressures to grayling habitat; climate change causing increases in river temperatures and reduction in water quality due to diffuse pollution are both likely to increase in the next twelve years. It is anticipated that diffuse pollution will begin to decrease after this time as changes in farm policy post Brexit and measures introduced through WFD and stakeholders such as Rivers Trusts begin to have a significant effect. There are also plans for applications for funding for works across the Dee. However, the positive effects on grayling habitat of interventions such as fencing and tree planting to increase riverine shading as well as better land management will only be seen over the long term.
10.1 Future prospects of parameters	Future range trend: Overall stable. Whilst habitat quality may be an issue over the next 12 years range is expected to remain stable. Future population trend: Overall stable Despite the pressures and threats to grayling habitat, grayling numbers appear to be resilient in the three native catchments in Wales. This reflects the ability of grayling to withstand certain pressures and it is predicted that numbers will continue to remain stable over the next twelve years (unless key water temperature or quality thresholds are reached). However, there is a growing awareness of the need to improve both river habitat and land management. It is anticipated that positive works due to interventions by organisations including Natural Resources Wales and rivers trusts alongside positive policy changes will mitigate impacts of these pressures before they cause grayling numbers to decline. Future habitat trend: Negative The two major pressures to grayling habitat; climate change causing increases in river temperatures and reduction in water quality due to diffuse pollution are both likely to increase in the next twelve years. It is anticipated that diffuse pollution will begin to decrease after this time as changes in farm policy post Brexit and measures introduced through WFD and stakeholders such as Rivers Trusts begin to have a significant effect. There are also plans for applications for funding for works across the Dee. However, the positive effects on grayling habitat of interventions such as fencing and tree planting to increase riverine shading as well as better land management will only be seen over the long term.