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

Supporting documentation for the Third Report by the United Kingdom under Article 17

on the implementation of the Directive
from January 2007 to December 2012
Conservation status assessment for

Species:

S1109 - Grayling (*Thymallus thymallus*)

IMPORTANT NOTE – PLEASE READ

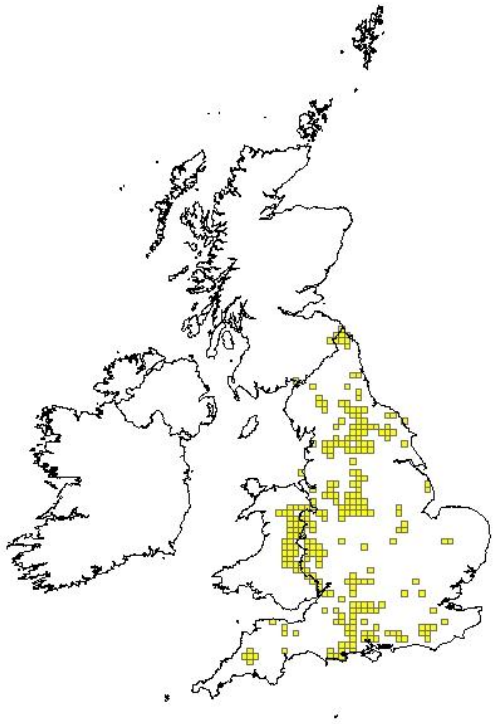
- The country-level reporting information contained in this document is a contribution to the Article 17 UK report for the habitat/species concerned.
- It has been provided by **Natural England** and refers only to the state of the habitat/species in **England** - it does not constitute an assessment for the whole of the UK.
- The Article 17 UK Approach document provides details on how this information has been used and, combined with information supplied by other Statutory Nature Conservation Bodies
- The format of the document is closely aligned to that set out by the European Commission for Member State reporting – as a result, some of the fields are not applicable at a country-level and have deliberately been left blank – in addition, the content of most fields is constrained by the EC reporting categories.

Reporting format on the 'main results of the surveillance under Article 11' for Annex II, IV & V species

Field name	*Brief explanations*	
0.2 Species	**0.2.1 Species code**	**S1109**
	0.2.2 Species scientific name	***Thymallus thymallus***
	0.2.3 Alternative species scientific name Optional	
	0.2.4 Common name Optional	**Grayling**

1.1 Maps		
1.1.1 Distribution map	**Sensitive**	**False**
	Like barbel, the natural distribution of grayling is thought to be limited to rivers in the south and east of England (Maitland 1992) that during the periglacial period formed part of the catchment of the Proto-Rhine, along with rivers of north western Europe such as the Schelde that now run into the North Sea and/or English Channel. Owing to its angling interest, the species has been widely distributed by anglers into other English rivers, so that it is now widely distributed in England in suitable habitat. In fact, the majority of UK grayling populations are thought to originate from stocking over the past 200 years, all from UK stock (Ibbotson et al. 2001). This is reflected in the fact that there are more records of grayling outside of the assumed natural range than within it. Possibilities have been raised through genetic studies that some northern rivers may also be part of the species' natural range (see reference in 2.2), with connecitivity possibly achieved by changes in watershed lines between east- and west-flowing river systems during the peri-glacial period. As a temperate/arctic species it is not climatically limited in England and the current distribution extends up to (and indeed into) Scotland. The spread of grayling by anglers has been of longer standing than that of barbel, and has created greater confusion over natural range. As a consequence grayling appears to be more accepted as natural/naturalised in its wider English range. For this reason grayling is not listed as translocated within any part of England in the UK's lists of 'locally absent' native fish species, whilst barbel is so listed in northern and western areas. Unlike barbel, therefore, records outside of the assumed natural range of grayling have been retained in the distribution map. The Environment Agency's Trout and Grayling Fisheries Strategy now restricts the stocking of grayling to within its current range, which should help prevent further artificial introduction of the species. Within the natural range, there are very few records in East Anglia and also large catchments such as the Nene and Great Ouse. This may be due to patchy recording, natural lack of suitable habitat), or loss of suitable habitat caused by channel modifications and other pressures. The grayling is a species of swift-flowing, gravel-bed rivers (although it can also occur in lakes), generally with high baseflow and relatively low	

	flashiness (for instance, relative to trout) . Such habitat is in short supply in East Anglia, although rivers running off the north Norfolk hills (such as the River Wensum SAC and the River Nar SSSI) might be expected to have suitable sections. The upper reaches of systems like the Nene and Great Ouse might also be expected to have suitable habitat.



1.1.2 Method used - map	**Estimate based on partial data with some extrapolation and/or modelling**
1.1.3 Year or period	**1990-2012**
1.1.4 Additional distribution map	**False**
1.1.5 Range map	

2.1 Biogeographical region & marine regions	**ATL**
2.2 Published sources	**"Nick Dawnay, Louise Dawnay, Roger N. Hughes, Richard Cove, Martin I. Taylor (2010) Substantial genetic structure among stocked and native populations of the European grayling (Thymallus thymallus, Salmonidae) in the United Kingdom. Conservation Genetics, Published on-line: DOI 10.1007/s10592-010-0179-4.** **M.C.Lucas and D.H.Bubb (2005) Seasonal movements and habitat use of grayling in the UK. Environment Agency Science Report, SC030210/SR. Environment Agency, Bristol.**

**DAVIES, C.E., SHELLEY, J., HARDING, P.T., MCLEAN, I.F.G., GARDINER, R. &
PEIRSON, G., (eds.) 2004. Freshwater fishes in Britain - the species and their distribution.
Harley Books, Colchester.**

**ENVIRONMENT AGENCY 2003. National Trout and Grayling Fisheries Strategy.
Environment Agency, Bristol.**

**IBBOTSON, A.T. COVE, R.J., INGRAHAM, A., GALLAGHER, M., HORNBY, D.D.,
FURSE, M. & WILLIAMS C. 2001. A Review of Grayling Ecology, Status and Management
Practice Recommendations for Future Management in England and Wales. Environment
Agency, Bristol.**

**MAITLAND, P.S. 2004. Keys to the Freshwater Fish of Britain and Ireland with notes on
their distribution and ecology. Freshwater Biological Association, Scientific Publication No.
62.**

**MAITLAND, P.S. & CAMPBELL, R.N. 1992. Freshwater Fishes of the British Isles.
HarperCollins, London.**

**PERSAT, H. 1996. Threatened populations and conservation of the European grayling,
Thymallus thymallus (L., 1758). In Conservation of Endangered Freshwater Fish in
Europe (Kirchhofer, A.& Hefti, D., eds), pp. 233–247. Birkhaeuser Verlag, Basel
(Switzerland).**

Mainstone, C.P. (2010) An evidence base for setting nutrient targets to protect river habitat. Natural England Research Reports, Number 034. Available at: http://publications.naturalengland.org.uk/publication/30027?category=440349

Mainstone, C.P. (2010) An evidence base for setting organic pollution targets to protect river habitat. Natural England Technical Information Note 076. Available at: http://publications.naturalengland.org.uk/publication/33008?category=440349

Mainstone, C.P. (2010) An evidence base for setting flow targets to protect river habitat. Natural England Research Reports, Number 035. Available at: http://publications.naturalengland.org.uk/publication/9025?category=440349

Environment Agency (2012) Summary of outcomes of the Review of Consents on water-related SACs. Excel spreadsheet.

	Natural England (2012) England Catchment Sensitive Farming Initiative. Http://www.naturalengland.org.uk/ourwork/farming/csf/default.aspx. **Wheeldon, J (2012) River Restoration Planning and implementation on River Sites of Special Scientific Interest in England. Internal Natural England paper.** **Mainstone, C.P., Dils, R.M. and Withers, P.J.A. (2008). Controlling sediment and phosphorus transfer to receiving waters – A strategic management perspective for England and Wales. Journal of Hydrology, 350, 131-143.** **Mainstone, C.P. and Holmes, N.T. (2010) Embedding a strategic approach to river restoration in operational management processes – experiences in England. Aquatic Conservation: Marine and Freshwater Ecosystems. Published online in Wiley InterScience (www.interscience.wiley.com). DOI: 10.1002/aqc.1095** **Mainstone C.P. (2008) The role of specially designated wildlife sites in freshwater conservation – an English perspective. Freshwater Reviews, 1, 89-98.** **Chris Mainstone & Alastair Burn (2011) Relationships between ecological objectives and associated decision-making under the Habitats and Water Framework Directives. Discussion paper, Natural England.** **Mainstone, C.P. and Clarke, S.J. (2008) Managing multiple stressors on sites with special protection for freshwater wildlife – the concept of Limits of Liability. Freshwater Reviews, 1, 175-187."**

2.3 Range	
2.3.1 Surface area Range	
	This includes the extension to historical range into northern and western parts of England.
2.3.2 Method used Surface area of Range	**Estimate based on partial data with some extrapolation and/or modelling**
2.3.3 Short-term trend Period	**2001-2012**
2.3.4 Short term trend Trend direction	**unknown**
	Extensions to range are historical and there is unlikely to be any trend in recent years. Apparent gaps in distribution within the species' natural range were reported in 2007 and so are not a recent phenomenon.

	However, owing to the apparent patchiness of recording, short-term trend has been reported as unknown.	
2.3.5 Short-term trend Magnitude	**a) Minimum**	
	b) Maximum	
2.3.6 Long-term trend Period	**1989-2012**	
2.3.7 Long-term trend Trend direction	**unknown**	
	Extensions to range are historical and there is unlikely to be any trend in the longer-term trend period. The species is reported to have been lost from some rivers in the past but these losses are likely to pre-date this trend period. They may also relate to rivers in which grayling were stocked but were natural unsuitable to self-sustaining populations. Owing to the patchiness of records, long-term trend has been reported as unknown.	
2.3.8 Long-term trend Magnitude Optional	**a) Minimum**	
	b) Maximum	
2.3.9 Favourable reference range	**a) Value in km²**	
	This estimate is based on current range and is large because of the inclusion of extended range beyond the species original range in England. Within the species original range, however, it seems likely that favourable reference range should be more extensive. Reported historical losses from some rivers appear to support this view although it is unclear whether these losses were from within the speciess' natural or extended range.	
	b) Operator for FRR	
	c) FRR is unknown (indicated by "true")	**False**
	d) Method used to set FRR	

2.3.10 Reason for change Is the difference between the reported value in 2.3.1 and the previous reporting round mainly due to…	**a) Genuine change?**	**False**
	b) Improved knowledge/more accurate data?	**False**
	c) Use of different method (e.g. "Range tool")?	**False**

2.4 Population		
2.4.1 Population size estimation (using individuals or agreed exceptions where possible)	**a) Unit**	
	b) Minimum	
	c) Maximum	
2.4.2 Population size estimation (using population unit other than individuals) Optional *(if 2.4.1 filled in)*	**a) Unit**	**number of map 10x10 km grid cells**
	b) Minimum	**221**
	This estimate should be considered a minimum estimate due to the patchiness of data recording.	
	c) Maximum	
2.4.3 Additional information on population estimates / conversion Optional	**a) Definition of "locality"**	
	b) Method to convert data	
	c) Problems encountered to provide population size estimation	
2.4.4 Year or period	**1990-2012**	
2.4.5 Method used	**Estimate based on partial data with some extrapolation and/or**	

Population size	**modelling**	
2.4.6 Short-term trend Period	**2001-2012**	
2.4.7 Short-term trend Trend direction	**unknown**	
	Short-term trend is unknown but likely to be stable across both the species' natural and naturalised ranges. However, there have been reported declines in Yorkshire that relate to this trend period that are worthy of note.	
2.4.8 Short-term trend Magnitude	**a) Minimum**	
	b) Maximum	
	c) Confidence interval	
2.4.9 Short-term trend Method used	**Absent data**	
2.4.10 Long-term trend – Period	**1989-2012**	
2.4.11 Long-term trend Trend direction	**unknown**	
	Long-term trend is unknown but likely to be stable across both the species' natural and naturalised ranges. It is reported to have been lost from some rivers in the past but these losses are likely to pre-date this trend period.	
2.4.12 Long-term trend Magnitude Optional	**a) Minimum**	
	b) Maximum	
	c) Confidence interval	
2.4.13 Long term trend	**1**	

Method used		
2.4.14 Favourable reference population	**a) Number of individuals/agreed exceptions/other units**	
	It has not been possible to estimate the favourable reference population, either in terms of the population unit used in 2.4.2 or numbers of individuals. In order to make an estimate a simple natural habitat suitability model would need to be constructed and applied to the English river network. This could be converted into numbers of individuals by applying typical abundance figures.	
	b) Operator	
	c) FRP is unknown indicated by "true"	**True**
	d) Method used to set FRP	
2.4.15 Reason for change Is the difference between the value reported at 2.4.1 or 2.4.2 and the previous reporting round mainly due to:	**a) Genuine change?**	**False**
	b) Improved knowledge/more accurate data?	**False**
	c) Use of different method (e.g. "Range tool")?	**False**

2.5 Habitat for the species	
2.5.1 Area estimation	
	It has not been possible to estimate habitat surface area. In order to make an estimate a simple natural habitat suitability model would need to be constructed and applied to the English river network. A fish typology has been developed for use in England and can be applied to the river network using a predictive model based on a few fundamental river characteristics (such as stream order, catchment area and baseflow index). This has been applied to routine sampling points in England - community types that relate to the presence of grayling are predicted to be reasonably extensive within the species assumed natural range, more extensive than the distribution of species records. Unfortunately it is not

	possible to generate an estimated habitat area from this information.	
2.5.2 Year or period		
2.5.3 Method used Habitat for the species		
2.5.4 Quality of the habitat	**a) Habitat quality**	**Moderate**
	The grayling is a species of cool, swift-flowing, gravel-bed rivers (although it can also occur in lakes), with good water quality, clean gravels and physical habitat complexity that provides shallow water and flow refuges for juveniles and deeper water for adults - wherever trout occur, there might be expected to be some suitable grayling habitat downstream. The English river network is subjected to a range of pressures that interfere with the provision of these conditions. Whilst there are no reports that grayling populations are currently suffering from these pressures on a widespread basis, and the species has extended its range well-beyond its original range, it is likely that factors such as siltation, nutrient enrichment, flow modifications, historical physical habitat modifications and possibly (in some lowland salmonid angling rivers) active fishery management constrain both the occurrence and abundance of the species within its natural range. A combination of these factors are likely to be responsible for the reported historical loss of the species from some rivers. The Article 17 report on H3260 provides a reasonable basis for characterising habitat quality for grayling, since H3260 is a widespread habitat in England and the range of grayling is also wide. Key points from that report are provided below. Assessment of the condition of rivers designated SAC for H3260 (which is the majority of the SAC river network in England) is based on evaluation of the environmental integrity of the habitat (in relation to water quality, hydrology, morphology, non-native species and some aspects of the status of the characteristic biological community. By habitat area, around 11% is recorded as favourable, 45% as Unfavourable recovering, and 43% as Unfavourable no change. There are typically multiple reasons for Unfavourable condition, which need to be addressed in a coordinated way to move SACs to Unfavourable recovering and ultimately Favourable condition. The large percentage of area recorded as Unfavourable recovering reflects the complex planning and lengthy timescales needed to resolve many of the key pressures on river systems. Within the wider network of nationally designated (SSSI) rivers designated for their river habitat, some 42% is recorded as Favourable, 33.5% as Unfavourable recovering, and 21% as Unfavourable no change. The higher proportion of area in Favourable condition relative to SACs is likely to be an artefact of the data, partly due to the inclusion of adjacent floodplain habitat in the figures which is often recorded as being in Favourable condition even though the adjacent river channel and its banks are not.	

	Beyond SACs and nationally designated sites, the main source of data on habitat condition is the Water Framework Directive (WFD). The WFD reports on the ecological status of rivers that form part of defined 'waterbodies'. Ecological status is defined in terms of a number of biological quality elements: the phytobenthos (algae and submerged higher plants), macroinvertebrates and fish, as well as the nutrient status of waterbodies. A number of environmental standards are also defined that support ecological status. Status categories are high, good, moderate, poor and bad. Where significant anthropogenic modifications are present in a waterbody, which cannot be removed to restore good ecological status, the waterbody is designated as heavily modified under the WFD and an objective is assigned in terms of ecological potential. There is no simple relationship between favourable condition of SAC/SSSI river habitat and ecological status classes. However, for most biological and environmental indicators that both assessment methods use, favourable condition is most closely associated with high ecological status. See Mainstone and Burn, (2011) in 2.2 for further explanation. Levels of habitat condition consistent with ecological potential objectives are set in relation to site-specific constraints and cost-benefit considerations and are not amenable to general comparison with favourable condition as defined for SACs and SSSIs. Mainstone (2011) provides summary statistics of WFD ecological status data across the English river network. About a third (30.3%) of all WFD river waterbodies in England have been designated as heavily modified and therefore have objectives relating to ecological potential rather than ecological status. Of those waterbodies not designated as heavily modified, around 70% were at less than good ecological status (ges) in the 2009 WFD baseline assessment, and only 4 waterbodies were at high ecological status (hes). This assessment is based on the worst performing quality element making up the assessment (biological quality elements and nutrient levels).	
	b) Assessment method	**Condition assessment of SAC rivers, wider assessment of ecological status under the Water Framework Directive. See Article 17 report on H3260.**
2.5.5 Short-term trend Period	**2001-2012**	
2.5.6 Short-term trend Trend direction	**increase**	
	The picture is complex but there has been significant progress with alleviating a number of of pressures, including nutrient enrichment and organic pollution.	
2.5.7 Long-term trend Period	**1989-2012**	
2.5.8 Long-term trend Trend direction	**increase**	
	The improving trend noted in 2.5.6 is also apparent over this longer time period.	
2.5.9 Area of suitable habitat for the species	**a) Value in km²**	
	No estimate is available.	
	b) Absence of data	

	indicated as '0'	
2.5.10 Reason for change Is the difference between the value reported at 2.5.1 and the previous reporting round mainly due to	**a) Genuine change?**	**False**
	b) Improved knowledge/more accurate data?	**False**
	c) Use of different method (e.g. "Range tool")?	**False**

2.6 Main pressures		
a) Pressure	**b) Ranking**	**c) Pollution qualifier**
	H = high importance M = medium importance L = low importance	
A01: Cultivation	H	
H01: Pollution to surface waters (limnic & terrestrial, marine & brackish)	H	X
J02: human induced changes in hydraulic conditions	H	
J03: Other ecosystem modifications	H	
F02: Fishing and harvesting aquatic resources	L	

A02/H01 - Many English rivers suffer from enhanced loads of fine sediment and nutrients, with fine sediments generated largely from the catchment and nutrients generated from both catchment sources and effluents. Other pollutants of concern include organic pollution from agriculture, biocides and oestrogenic substances.

F02 - There has been a tradition in England of rod anglers taking grayling for the table (as with other salmonids), but exploitation rates are now extremely low (0.16%, from 2001-2008 data provided by the Environment Agency) and are not considered a threat to any populations. On some lowland salmonid rivers there has historically been a tradition of removal of grayling on the basis that they compete with salmonids and interfere with salmonid angling, which may conceivably be a factor in the absence of grayling from some rivers within its natural range. However, since the establishment of the Grayling Society in 1977, attitudes of fishery managers towards the grayling have changed considerably and they are now widely considered to be a fishery asset. This change of attitude is supported by the Environment Agency's Trout & Grayling Fisheries Strategy, which prevents large-scale removals of grayling.

J02 - The English river network is subjected to considerable amounts of flow regime modification, including

headwater impoundment and flow regulation, and groundwater and direct river abstraction. Flow modification can reduce both current velocities (with consequences for substrate conditions and water quality) and habitat extent. Flow regulation of more energetic rivers can improve conditions for grayling at the expense of conditions favourable to the characteristic biological community. This has been the case in some rivers to which grayling has been introduced. It is possible, therefore, that restoring natural processes to some rivers may result in a decline of grayling populations, but to the benefit of the characteristic biological community of these rivers.

J03 - The English river network has been extensively physically modified, particularly within the original range of the species. Impounding structures can reduce current velocities and enhance siltation of coarse substrates. Weirs can interfere with the upstream spawning migrations grayling make. In England, migrations of up to 3km have been observed on small Yorkshire rivers (see reference in 2.2), often stopped by the presence of weirs. The natural extent of migration will relate to both the size of the river (the bigger the river the larger the migration) and the availability of suitable habitats to fulfil the species requirements (the nearer the suitable spawning habitat the shorter the migration). Much longer migrations have been observed in Europe than those observed in England. Simplification of physical habitat provision has a range of impacts including reducing the availability of shallow water and flow refugia for juveniles, and water depth for adults. The greater the natural habitat complexity, the less need there is for significant spawning migrations.

2.6.1 Method used – Pressures	**based exclusively or to a larger extent on real data from sites/occurrences or other data sources**

2.7 Threats		
a) Threat	**b) Ranking**	**c) Pollution qualifier**
	H = high importance M = medium importance L = low importance	
A02: modification of cultivation practices	H	
H01: Pollution to surface waters (limnic & terrestrial, marine & brackish)	H	X
J02: human induced changes in hydraulic conditions	H	
J03: Other ecosystem modifications	H	
M01: Changes in abiotic conditions	M	
F02: Fishing and harvesting aquatic resources	L	

All of the pressures listed in 2.6 are set to continue in the future. Measures in place or being planned will reduce some of them, although the new momentum behind hydropower generation is threatening to stall progress on removing artificial barriers to fish movement. Whilst significant new impounding structures are

unlikely in England, small-scale hydropower generation is creating a potential new use for many structures that were being earmarked for removal to restore natural river processes and access. Water resource demands are also set to increase as a result of increased probabilities of drought and a rising human population. Climate change is a considerable threat to English grayling populations, particularly in its original range where cooler waters will become rarer as climate change proceeds. A further climate change threat is the trend for more frequent and higher magnitude spate events on English rivers. Grayling redds are very shallow compared to other salmonids (usually around 5cm) and are therefore very susceptible to wash-out. Restoring natural river processes and habitat heterogeneity (including restoration of patchy riparian tree cover) has been identified as the most important climate change adaptation measure for river habitats and their biological communities.

2.7.1 Method used – Threats	**expert opinion**

2.8 Complementary information	
2.8.1 Justification of % thresholds for trends	
2.8.2 Other relevant information	
2.8.3 Trans-boundary assessment	

2.9 Conclusions *(assessment of conservation status at end of reporting period)*
Please refer to the United Kingdom assessment for this species.

3 Natura 2000 coverage & conservation measures - Annex II species
(only applies to species listed under Annex II of the Directive)

3.1 Population		
3.1.1 Population size Estimation of population size included in the SAC network	**a) Unit**	
	b) Minimum	
	c) Maximum	
3.1.2 Method used		

3.1.3 Trend of population size within the network (short-term trend)	

3.2 Conservation measures														
Conservation measures taken (i.e. already being implemented) within the reporting period and provided information about their importance, location and evaluation.														
3.2.1 Measure	**3.2.2 Type**					**3.2.3 Ranking** H = high importance M = medium importance L = low importance	**3.2.4 Location** where the measure is PRIMARILY applied			**3.2.5 Broad evaluation of the measure**					
	a) Legal/statutory	**b) Administrative**	**c) Contractual**	**d) Recurrent**	**e) One-off**		**a) Inside**	**b) Outside**	**c) Both inside & outside**	**a) Maintain**	**b) Enhance**	**c) Long term**	**d) No effect**	**e) Unknown**	**f) Not evaluated**