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

Conservation status assessment for the species:

S6963 - Spined loach (*Cobitis taenia*)

UNITED KINGDOM

IMPORTANT NOTE - PLEASE READ

- The information in this document represents 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.
- It is based on supporting information provided by the geographically-relevant Statutory Nature Conservation Bodies, which is documented separately.
- The 2019 Article 17 UK Approach document provides details on how this supporting information contributed to the UK Report and the fields that were completed for each parameter.
- The reporting fields and options used are aligned to those set out in the European Commission guidance.
- Maps showing the distribution and range of the species are included (where available).
- Explanatory notes (where provided) are included at the end. These provide additional audit trail information to that included within the UK assessments. Further underpinning explanatory notes are available in the related country-level reports.
- 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; and/or (iii) the field was not relevant to this species (section 12 Natura 2000 coverage for Annex II species).
- The UK-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**
1.2 Species code	**6963**
1.3 Species scientific name	**Cobitis taenia Complex**
1.4 Alternative species scientific name	
1.5 Common name (in national language)	Spined loach

2. Maps

2.1 Sensitive species	No
2.2 Year or period	2013-2018
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?	No	
3.2 Which of the measures in Art. 14 have been taken?	a) regulations regarding access to property	No
	b) temporary or local prohibition of the taking of specimens in the wild and exploitation	No
	c) regulation of the periods and/or methods of taking specimens	No
	d) application of hunting and fishing rules which take account of the conservation of such populations	No
	e) establishment of a system of licences for taking specimens or of quotas	No
	f) regulation of the purchase, sale, offering for sale, keeping for sale or transport for sale of specimens	No
	g) breeding in captivity of animal species as well as artificial propagation of plant species	No
	h) other measures	No

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3.3 Hunting bag or quantity taken in the wild for Mammals and Acipenseridae (Fish)

a) Unit

b) Statistics/ quantity taken	Provide statistics/quantity per hunting season or per year (where season is not used) over the reporting period					
	Season/ year 1	Season/ year 2	Season/ year 3	Season/ year 4	Season/ year 5	Season/ year 6
Min. (raw, ie. not rounded)						
Max. (raw, ie. not rounded)						
Unknown	No	No	No	No	No	No

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

3.5. Additional information

BIOGEOGRAPHICAL LEVEL

4. Biogeographical and marine regions

4.1 Biogeographical or marine region where the species occurs

Atlantic (ATL)

4.2 Sources of information

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5. Range

5.1 Surface area (km²)	20888.12
5.2 Short-term trend Period	2013-2018
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	Based mainly on extrapolation from a limited amount of data
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 Approximately equal to (≈) c) Unknown d) Method The FRR has changed since 2013. An FRR operator has been used because it has not been possible to calculate the exact FRR value. The FRR is considered to be sufficient to maintain a viable population and is no less that when the Habitats Directive came into force in the UK. For further details see the 2019 Article 17 UK Approach document.
5.11 Change and reason for change in surface area of range	Use of different method The change is mainly due to: Use of different method
5.12 Additional information	The current range surface area calculation does not represent the real range surface area. Change in availability of underpinning mapping data has resulted in an apparent decrease in range area compared to 2013, but this is not due to genuine change. Expert opinion considers the trend in range to be stable. The real range surface area is considered to be the range in 2013 - 27,201.5km2. The FRR in 2013 was 24,536 km2. this has been changed to an operator for this

reporting round. For further information see the 2019 Article 17 UK Approach document.

6. Population

6.1 Year or period	2013-2018	
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	175
6.3 Type of estimate	Minimum	
6.4 Additional population size (using population unit other than reporting unit)	a) Unit	
	b) Minimum	
	c) Maximum	
	d) Best single value	
6.5 Type of estimate		
6.6 Population size Method used	Based mainly on 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 expert opinion with very limited data	
6.11 Long-term trend Period	1994-2018	
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	x
	d) Method	The FRP for this species is unknown because there is insufficient information to set an FRP value. The FRP value was also unknown in 2013. For further information see the 2019 Article 17 UK Approach document.
6.16 Change and reason for change in population size	Use of different method	
	The change is mainly due to:	Use of different method

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6.17 Additional information	The current population calculation does not represent the real population. Change in availability of distribution data has resulted in an apparent decrease in the population compared to 2013, but this is not due to genuine change. Expert opinion considers the trend in population to be stable. The population in 2013 was 531km2. When map 10km range distribution data are viewed, there is an obvious correlation in coverage between the 2013 & 2019 reports. This indicates that differences in population calculations between 2013 and 2019 are likley to be due to differences in data collection or sampling effort. There is no evidence for a genuine decline in species populations. Evidence would generally indicate a slowly improving picture for habitat for this species, which should at least ensure a stable population. The lack of a coordinated monitoring programme which takes account of their cryptic lifestyle and encompasses all lifestages of spined loach makes it impossible to accurately assess whether the population is recruiting efficiently. The continued presence of adult spined loach within a river catchment would indicate that the population has remained viable over time and is recruiting successfully. However, the expansion of non-native crayfish populations has the potential to increase mortality rates and reduce egg numbers in benthic fish species such as spined loach and may therefore cause a deviation from the unimpacted condition. For further information see the 2019 Article 17 UK Approach document

7. Habitat for the species

7.1 Sufficiency of area and quality of occupied habitat	a) Are area and quality of occupied habitat sufficient (for long-term survival)?	Yes
	b) Is there a sufficiently large area of unoccupied habitat of suitable quality (for long-term survival)?	
7.2 Sufficiency of area and quality of occupied habitat Method used	Based mainly on expert opinion with very limited data	
7.3 Short-term trend Period	2007-2018	
7.4 Short-term trend Direction	Stable (0)	
7.5 Short-term trend Method used	Based mainly on expert opinion with very limited data	
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
Physical alteration of water bodies (K05)	H
Modification of hydrological flow (K04)	M
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	H

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Invasive alien species of Union concern (I01)	M
Freshwater fish and shellfish harvesting (recreational) (G06)	M
Abstraction of ground and surface waters (including marine) for public water supply and recreational use (F33)	M

Threat	Ranking
Physical alteration of water bodies (K05)	H
Modification of hydrological flow (K04)	H
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	M
Other climate related changes in abiotic conditions (N09)	M
Invasive alien species of Union concern (I01)	M
Freshwater fish and shellfish harvesting (recreational) (G06)	M
Abstraction of surface and ground water for energy production (excluding hydropower) (D13)	M
Abstraction of ground and surface waters (including marine) for public water supply and recreational use (F33)	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

Restore the habitat of the species (related to 'Habitat for the species')

9.3 Location of the measures taken

Both inside and outside Natura 2000

9.4 Response to the measures

Medium-term results (within the next two reporting periods, 2019-2030)

9.5 List of main conservation measures

Reduce impact of mixed source pollution (CJ01)
Reduce impact of multi-purpose hydrological changes (CJ02)
Restore habitats impacted by multi-purpose hydrological changes (CJ03)
Adopt climate change mitigation measures (CN01)
Management, control or eradication of established invasive alien species of Union concern (CI02)
Management of hunting, recreational fishing and recreational or commercial harvesting or collection of plants (CG02)
Adapt/manage exploitation of energy resources (CC02)
Manage water abstraction for public supply and for industrial and commercial use (CF11)

9.6 Additional information

10. Future prospects

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10.1 Future prospects of parameters	a) Range	Good
	b) Population	Good
	c) Habitat of the species	Good
10.2 Additional information	Future trend of Range is Positive - increasing <=1% (one percent or less) per year on average; Future trend of Population is Positive - increasing <=1% (one percent or less) per year on average; and Future trend of Habitat for the species is Positive - slight/moderate improvement. As improvements continue to be made regarding water quality and re-establishment of natural riverine processes, the area of freshwater habitat suitable for spined loach may be expected to increase. Effects of climate change are unknown. There is potential for continued diffuse agricultural pollution resulting in inputs of nutrients and fine sediment. The increase in non-native crayfish populations could also have an impact. For further information on how future trends inform the Future Prospects conclusion see the 2019 Article 17 UK Approach document.	

11. Conclusions

11.1. Range	Favourable (FV)
11.2. Population	Unknown (XX)
11.3. Habitat for the species	Favourable (FV)
11.4. Future prospects	Favourable (FV)
11.5 Overall assessment of Conservation Status	Favourable (FV)
11.6 Overall trend in Conservation Status	Stable (=)
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	Conclusion on Range reached because: (i) the short-term trend direction in Range surface area is stable; and (ii) the current Range surface area is approximately equal to the Favourable Reference Range. Conclusion on Population reached because: (i) the short-term trend direction in Population size is stable; and the Favourable Reference Population is unknown. Conclusion on Habitat for the species reached because: (i) the area of occupied habitat is sufficiently large and (ii) the habitat quality is suitable for the long-term survival of the species; and (iii) the short-term trend in area of habitat is stable. Conclusion on Future prospects reached because: (i) the Future prospects for Range are good; (ii) the Future prospects for Population are good; and (iii) the Future prospects for Habitat for the species are good.

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Overall assessment of Conservation Status is Favourable because three of the conclusions are Favourable and one is Unknown.

Overall trend in Conservation Status is based on the combination of the short-term trends for Range – stable, Population – stable, and Habitat for the species – stable.

Overall assessment of Conservation Status has not changed since 2013.

Overall trend in conservation Status was not specified in 2013, but is likely to have been stable.

12. Natura 2000 (pSCIs, SCIs and SACs) coverage for Annex II species

12.1 Population size inside the pSCIs, SCIs and SACs network (on the biogeographical/marine level including all sites where the species is present)	a) Unit	number of map 1x1 km grid cells (grids1x1)
	b) Minimum	
	c) Maximum	
	d) Best single value	10
12.2 Type of estimate		Minimum
12.3 Population size inside the network Method used		Based mainly on expert opinion with very limited data
12.4 Short-term trend of population size within the network Direction		Stable (0)
12.5 Short-term trend of population size within the network Method used		Based mainly on expert opinion with very limited data
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

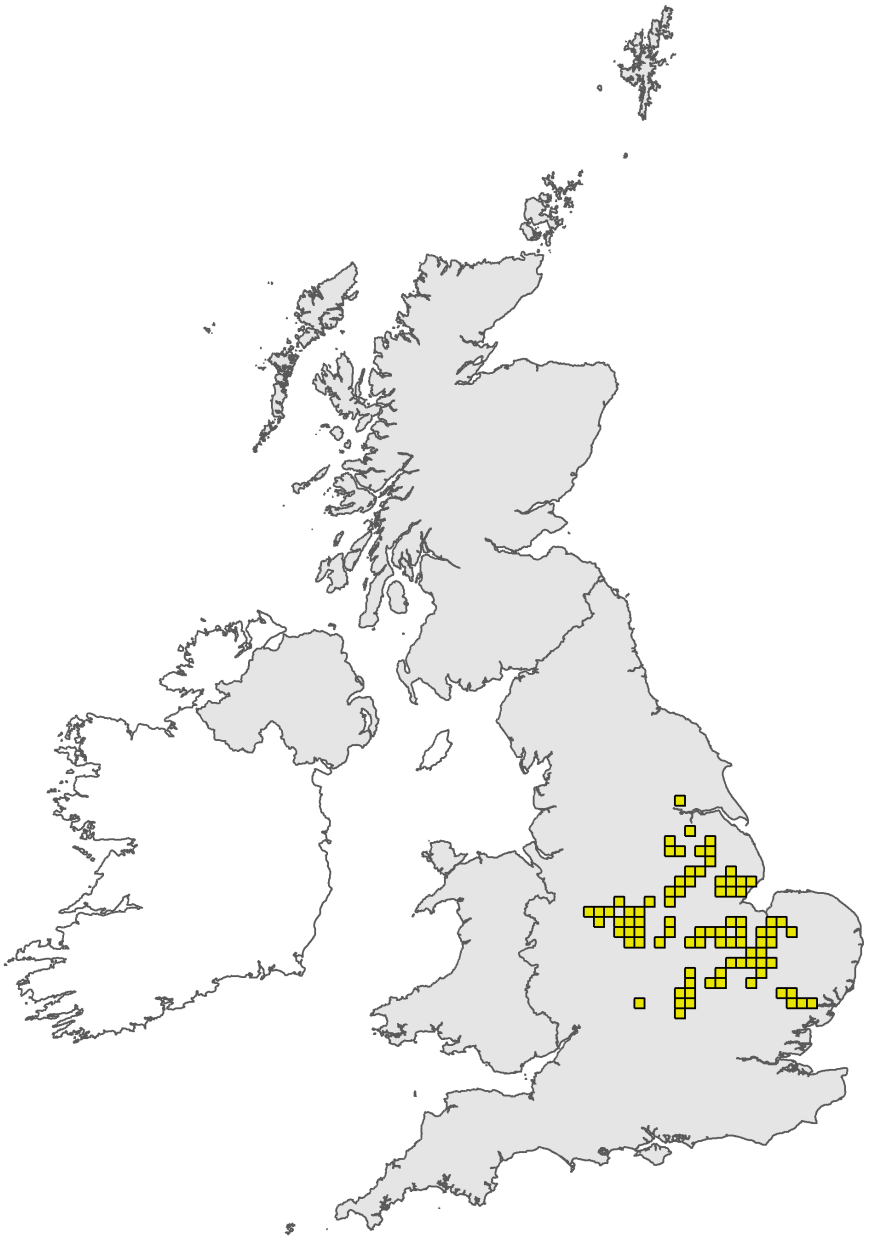

Figure 1: UK distribution map for S6963 - Spined loach (*Cobitis taenia*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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 S6963 - Spined loach (*Cobitis taenia*). 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: Cobitis taenia Complex (6963)

Field label	Note
2.4 Distribution map; Method used	Adult spined loach are captured during routine electric fishing surveys (although the techniques may be refined for spined loach specific surveys) and benthic kick samples, therefore, recording effort across England is relatively high. However, they may be under recorded in some habitats due to the cryptic nature and habitat of spined loach, lifecycle, diel behaviour and operational difficulties using electric fishing gear in typical spined loach habitat. Due to the lack of angling interest in this species and relatively slow colonisation of newly available habitats, all English spined loach records have been mapped. Mapping data may therefore include outliers due to misidentification or recording errors.

Species name: Cobitis taenia Complex (6963) Region code: ATL

Field label	Note
5.10 Favourable reference range	When map 10km range distribution data is viewed, there is an obvious correlation in coverage between 2013 & 2019 reports, indicating that differences in area calculations are likley to be due to data collection or sampling effort differences. In addition, a longer time period was used in the previous reporting round to generate range statistics. For this reporting round records from 2013 onwards were used. We do not have evidence for a genuine decline in species range, evidence would generally indicate a slowly improving picture for spined loach habitat within English rivers.
5.12 Additional information	Adult spined loach are captured during routine electric fishing surveys (although the techniques may be refined for spined loach specific surveys) and benthic kick samples, therefore, recording effort across England is relatively high. However, they may be under recorded in some habitats due to the cryptic nature and habitat of spined loach, lifecycle, diel behaviour and operational difficulties using electric fishing gear in typical spined loach habitat.
6.6 Population size; Method used	A detailed methodology used for population assessment at the 1 km2 resolution and the associated interpolation approach can be found in the Interagency Freshwater Group paper, Procedure for estimating population using 1km square resolution records data (Hatton-Ellis, 2018).
6.8 Short term trend; Direction	When map 10km range distribution data is viewed, there is an obvious correlation in coverage between 2013 & 2019 reports. Changes in 10km scale data will influence 1km scale population calculations. This indicates that differences in population calculations are likley to be due to data collection or sampling effort differences. We do not have evidence for a genuine decline in species population, evidence would generally indicate a slowly improving picture for spined loach habitat within English rivers which should at least ensure a stable population.
6.8 Short term trend; Direction	Records for spined loach are common throughout the short term trend period, however, survey effort is not consistant across the species range. In addition, specific surveys targeting spined loach and taking into account their particular behavioural traits such as burrowing and nocturnal activity are limited within the data set. It is therefore impossible to accurately assess a trend direction. The species is being regularly recorded across its natural range and there has been no significant increase in pressures. Water quality of many English rivers has improved in recent years, particularly in rivers such as the River Trent in the Midlands, improving the probability of both adult and juvenile survival. It is likley that the population is stable and possibly increasing.

6.12 Long term trend; Direction	Due to varying levels of survey effort throughout the spined loach range it is not possible to accurately assess population trends for this period. However, as the species has been consistantly recorded across much of its natural range the species is considered to be at least stable. In addition there has been a marked improvement in water quality in many English rivers over the period, which may in turn benefit adult and juvenile survival. It would be reasonable to expect an increasing trend in the population over this period, although this may have been counteracted somewhat by the rapid expansion of the invasive, non-native signal crayfish population which has the potential to impact on benthic fish species.
6.16 Change and reason for change in population size	A detailed methodology used for population assessment at the 1 km2 resolution and the associated interpolation approach can be found in the Interagency Freshwater Group paper, Procedure for estimating population using 1km square resolution records data.
7.1 Sufficiency of area and quality of occupied habitat	The FRP is considered to be large enough to support a viable spined loach population for the forseeable future and the range estimate is no lower than the range estimate in 1994 when the Habitats Directive came into force in the UK. However, spined loach populations are reduced across England when compared with their natural/unimpacted reference condition. This decline is generally attributed to historical reductions in habitat quality due to poor water quality which are still on-going but being slowly being addressed and improving. Access restrictions to historical river habitat due to poor water quality is thought to have been responsible for the reduction in spined loach numbers within English rivers. The extent to which poor water quality has effected spined loach populations is uncertain, however, nutrient enrichment and the deposition of organic matter may result in anoxic fine sediments which are unsuitable for spined loach. In addition, macrophytes may be lost from water courses due to pollution. This may reduce cover for adults and anchor points for egg deposition. Although adullt spined loach are known to favour fine sediments for refuge and feeding during daylight hours, a mosaic of microhabitats which includes areas of open sediment for feeding and stands of macrophytes and stoney substrates for egg deposition may be utilised during the more active nocturnal phase of their liefcycle. Excessive sediment loads due to agricultural sources has the potential to transform this habitat mosaic into a homogenious silted environment which may impact on spined loach recuitment. Excessive predation may impact on spined loach. Due to their small size spined loach are liable to be preyed upon by a number of coarse fish species, therefore, additional stocking for recreational angling purposes may increase predation rates. Invasive non-native crayfish species such as signal crayfish Pacifastacus leniusculus also have the potential to increase predation pressure on both spined loach and their eggs. Invasive non-native crayfish may be more aggressive, more tolerant of poor water quality, better adapted to silty substrates and achieve greater biomasses than the indigenous white clawed crayfish Austropotamobious pallipes which may have co-existed with spined loach in rivers such as the Rive Mease, within the Trent catchment. The invasion of habitats by INNS crayfish and the displacement of indigenous crayfish species may therefore have led to an increase in interspecific competition with between crayfish and spined loach. It is likely that the effects of water quality, physical habitat degredation and predation are highly variable across the range of spined loach. The current water quality barriers are likely to limit access to some areas of habitat which would be of suitable quality to maintain a viable spined loach population, however, while a viable population of spined loach will be maintained for the forseeable future, without further improvements in both water quality and habitat quality, there is unlikley to be a sufficient area of currently unoccupied high quality habitat to maintain the species at unimpacted FCS.

7.4 Short term trend; Direction	Spined loach require a mosaic of microhabitats including areas of open sediment for feeding and stands of macrophytes and stoney substrates for egg deposition. These factors, combined with sporadic survey effort make a detailed assessment of habitat quality trends for spined loach impossible at the present time. However, progress has been made with reducing nutrient and organic pollution concentrations in many rivers across England within the short-term trend period, which may have a beneficial effect on habitat quality for spined loach. However habitat degradation is still a significant stressor on spined loach populations within England and improvements may be off-set by the continued expansion of INNS crayfish range.

8.1 Characterisation of pressures/ threats	Pressures: K05 - Physical modification of river channels may remove habitat heterogeneity and the mosaic of microhabitats utilised by spined loach at different stages of their lifecycle. Although spined loach are not thought to undertake large scale migratory movements, if water quality improvements open up potential new/historic upstream habitat within a river, colonisation of these areas by spined loach may be blocked by man-made in-stream barriers such as weirs. These barriers may also act synergistically with water quality problems such as increased sediment and nutrient load. Impoundments behind structures may lead to increased deposition of fine sediment on gravels and dissolved oxygen sags due to a lack of turbulent flow. In some areas fish passes have been added to barrier structures, however, these tend to be focused on increasing turbulent flows for the passage of salmonid species and are not suited to the passage of spined loach which require lower flow velocities and would therefore be excluded from colonising newly available upstream habitat. This problem may become acute in the event of a catastrophic pollution event occurring high in a river catchment. Downstream populations of spined loach which succeeded in finding refuge and survived the passage of the pollutant may then be unable to recolonise upstream areas of the catchment due to physical barriers. K04 - Spined loach require a habitat mosaic of fine silt for refuge and feeding, macrophytes for cover and coarser substrates and/or macrophytes for egg deposition . Changes to the hydrological regime may increase deposition rates of fine sediment on gravels, increase the resistance of structures to passage by spined loach and lead to stranding of fish or desiccation of eggs during low flows. In addition river engineering works may increase spate flow velocities within the catchment which may result in spined loach being washed out of areas of favourable habitat within the river system. If low flows are maintained over long periods of time, elevated water temperatures, deoxygenation, siltation and bed armouring may become evident. Conversely very high flows may scour spawning substrates and deposited eggs or silt substrates for adult refuge. J01 - Diffuse agricultural pollution has increased the input of fine sediment, phosphate and nitrate to rivers leading to eutrophication issues such as increased algal production and changes in the macrophyte community. Urbanization and industrialization have resulted in discharges of both raw and treated sewage effluent, industrial effluents and diffuse urban pollution. These discharges may prove acutely toxic to spined loach or produce lethal effects due to deoxygenation. A wide variety of other chemicals, including pesticides and endocrine disrupters, have been released into the aquatic environment. Spined loach may be particularly vulnerable to deposited pollutants due to their burrowing and feeding habits. Pollutants may result in obvious lethal effects, however, a wide variety of sub-lethal effects, such as reduced fertility may affect the overall fitness of spined loach. Due to the diverse array of sources and impacts, the severity and contribution of each individual stressor on the population as a whole is unknown. N09 - Increases in temperature may produce synergistic effects with other environmental stresses such as increased toxicity of pollutants and more rapid deoxygenation. Low flows may reduce the ability of spined loach to pass barriers and reach new habitat. High spate flows may lead to fish and eggs being washed out of areas of suitable habitat. I01 - Invasive non-native crayfish species such as signal crayfish Pacifastacus leniusculus have the potential to increase predation pressure on both spined loach and their eggs. Invasive non-native crayfish may be more aggressive, more tolerant of poor water quality, better adapted to silty substrates and achieve greater biomasses than the indigenous white clawed crayfish Austropotamobious pallipes which may have co-existed with spined loach in rivers such as the River Mease, within the Trent catchment. The invasion of habitats by INNS crayfish and the displacement of indigenous crayfish species may therefore have led to an increase in interspecific competition with between crayfish and spined loach. G06/I04 - Due to their small size spined loach are liable to be preyed upon by a number of coarse fish species, therefore, additional stocking for recreational angling purposes may increase predation rates, particularly if locally non-native fish species are introduced. D13 -

Spined loach are present in a number of English rivers, such as the River Trent, associated with power station abstraction points. Due to their relatively sedentary nature they may be susceptible to direct entrainment in cooling water abstractions or dissolved oxygen fluctuations due to the discharge of artificially warm water from these sites. F33 - In addition to the risks posed by entrainment into pumps and associated infrastructure related to public water supply, water transfer schemes have the potential to allow the cross catchment movement of spined loach and allow genetic mixing of previously discrete, isolated populations, therefore limiting the genetic diversity. Threats: K05 - Due to changes in legislation to control in-channel works, such as dredging, in certain situations land owners may undertake work on ditch systems on their land which may cause impacts on spined loach present within the main river channel. This situation has arisen in localised areas such as the River Mease SAC, however, if this type of action was to be taken more widely within catchments containing spined loach there would be the potential to negatively impact on the species. Although new barriers are unlikely to be built within river systems used by spined loach, the modification of existing structures by the addition of fish passes unsuitable for spined loach, may hinder the removal / decommissioning of these structures. Such investment will allow the impact of these structures on river habitats and associated impacts on spined loach to be perpetuated. K04 - increased pressure on water supplies for drinking water and agricultural irrigation may lead to increased abstraction and lower flows within the channel. Increased channel engineering and flow modification for flood risk management may continue to degrade the complex habitat mosaic required for spined loach to complete their lifecycle. J01 - while great improvements have been made in water quality across England, particularly relating to point source inputs of gross organic pollution, diffuse rural sources of nutrients and sediment emanating from agricultural land use are likely to continue to be a stress on the aquatic environment. N09 - The potential for climate change to impact on future spined loach populations is poorly understood. However, future climate change scenarios indicate a shift to a pattern of increasingly extreme events such as more prolonged low flows and higher, more energetic spate flows. This is likely to add further stress to spined loach populations. I01 - Signal crayfish, together with other INNS crayfish species, continue to increase their range and populations in many English river catchments, including rivers such as the River Mease SAC which hold populations of spined loach. There are no effective control measures for INNS crayfish and their range is expected to continue to expand in river networks for the foreseeable future. G06/I04 - Competitive pressure from locally non-native fish species and / or fish species stocked above their natural carrying capacity is likely to remain at or above current levels as there is no suitable method of control for these species and pressure from recreational angling interests for high stock densities is likely to continue. D13 - The risk of entrainment in power station cooling water abstractions or the impacts on water quality from discharges with elevated temperatures is expected to continue in many areas. F33 - As the demand for potable water continues to rise there will be an increased reliance on inter-catchment water transfer schemes. New schemes may increase the risk of homogenising the genetic structure of spined loach, a species with already limited genetic variation.

9.5 List of main conservation measures	CJ01 - Work has continued to reduce discharges to both the Natura and wider river network. Major infrastructure projects to improve sewerage, such as removal or upgrade of combined sewer overflows and improved phosphorus removal from treated sewage effluent, has been funded via the water industry's programme of strategic improvements such as AMP and PR rounds. However, further investigations are needed into the application of new best available technology for phosphorus removal and the increased availability of mains sewerage for rural populations. The England Catchment Sensitive Farming Initiative is continuing to promote a range of best agricultural practices to reduce pollution loads to priority aquatic sites. A combination of Natura 2000, SSSI and Water Framework objectives continues to drive improvements in water quality with diffuse water pollution prevention plans developed for many sites. CJ02/CJ03 - Abstraction management - Improvements have been achieved with limiting abstraction volumes and improving flow regimes by altering compensation flows from water company assets via AMP and PR rounds. However, further improvements are required to naturalise flows at many sites. As part of the on-going abstraction reform process, abstraction licences will become environmental permits and a greater emphasis will be given to environmental considerations. By 2022 all previously exempt abstractions will be permitted. CJ02/CJ03 - Physical habitat restoration - A major programme of physical restoration has been implemented on the designated river network, involving the development of a long-term strategic plan for each river and its programmed implementation. These plans address key issues such as dams and weirs, floodplain reconnection, channel modifications, lack of riparian habitat, lack of riparian trees and lack of woody debris in the channel. Outside of the designated site network, river restoration schemes have focused on addressing channel modifications and the many weirs and dams on the river network in England. A further driver for river restoration has been the increased prominence of natural flood management. If properly implemented, NFM has the potential to enable widespread improvements in many previously degraded riverine habitats. CN01 - The rationale behind restoring river habitat in England is the restoration of natural riverine processes, which creates characteristic habitats and provides for individual species to an extent dependent on the natural character of the river. This rationale is also the main adaptation response for combatting climate change. Some aspects of restoring natural function are also seen as climate change mitigation measures, such as the re-establishment of natural tree cover and riparian vegetation which is being implemented as part of many river restoration schemes and agri-environment schemes. These interventions may result in moderated extremes of flow, reductions in water temperature and increased water quality CL02 / CG02 - Section 14 of the Wildlife and Countryside Act (WCA) prohibits the introduction into the wild of any animal of a kind which is not ordinarily resident in, and is not a regular visitor to, Great Britain in a wild state, or any species of animal or plant listed in Schedule 9 to the Act. Schedule 9 lists non-native species that are already established in the wild, but which continue to pose a threat to native biodiversity and habitats such that further releases should be regulated. The EU Invasive Alien Species (IAS) Regulation (1143/2014) came into force on 1 January 2015. The Regulation imposes restrictions on species known as 'species of Union concern'. These are species whose potential adverse impacts across the European Union are such that concerted action across Europe is required. Under the Water Framework Directive (WFD) invasive non-native species (INNS) have been classified as high, moderate, low or unknown impact. Their presence prevents a site reaching high ecological status. They may also affect the ability of waterbodies to reach the default objective of good ecological status, or may cause a deterioration of status away from good status. The presence of viable populations of high impact non-native species constitutes a reason for unfavourable condition of SSSIs and SACs notified for their freshwater habitat. The presence of any non-native species may constitute a reason for unfavourable condition of SSSIs and SACs notified for either their freshwater habitat or particularly freshwater species, depending on the nature of the effect. The Live Fish Movement Scheme (LFMS)

	enacts the Keeping and Introducing Fish Act 2015 (KIFA). It lists Invasive non-native fish species (Annex 1 species) which cannot be kept in water bodies without a licence and controls the stocking of locally non-native fish species. There are a number of strategies in England aimed at limiting the spread of invasive species. Examples include the development of pathway action plans such as the 'angling pathway action plan' and the 'boating pathway action plan' which are required under the IAS regulations, the implementation of the Great Britain Invasive Non-Native Species Strategy and publicity via stakeholders surrounding the importance of biosecurity protocols. CC02 / CF11 - Detailed assessments are being made of potential risks to spined loach due to abstractions, discharges, potential barrier effects and inter-catchment connectivity from existing and new energy and water supply infrastructure. Where problems are highlighted mitigation measures such as improved screening or modified operating procedures are being implemented.
10.2 Additional information	As improvements continue to be made regarding water quality and re-establishment of natural riverine processes in England the area of freshwater habitat suitable for spined loach may be expected to increase. Set in opposition to this generally positive outlook are the unknowns of climate change effects which may lead to more extreme flow variations, the potential for continued diffuse agricultural pollution resulting in inputs of nutrients and fine sediment, the increase in non-native crayfish populations and the possibility of increases in energy production and water supply infrastructure.