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:

S1095 - Sea lamprey (*Petromyzon marinus*)

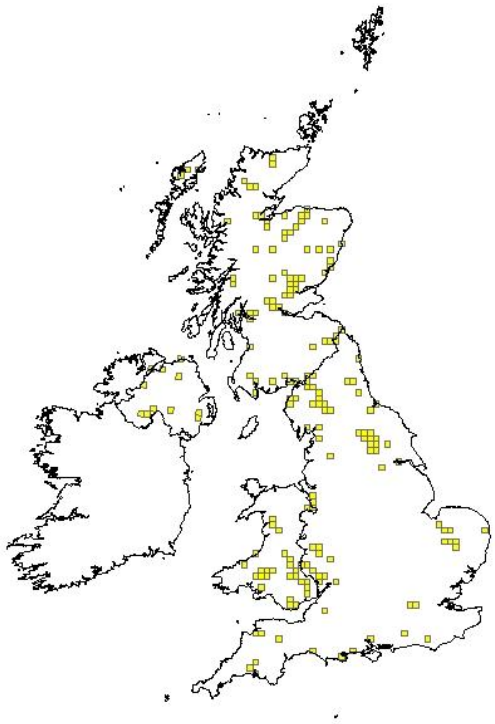
IMPORTANT NOTE – PLEASE READ

- 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**	**S1095**
	0.2.2 Species scientific name	***Petromyzon marinus***
	0.2.3 Alternative species scientific name Optional	
	0.2.4 Common name Optional	**Sea lamprey**

1.1 Maps			
1.1.1 Distribution map		**Sensitive**	**False**



1.1.2 Method used - map	**Estimate based on partial data with some extrapolation and/or modelling**
	Since the last reporting round there has been improved awareness of sea lamprey and recording efforts have increased substantially. The current map is a considerably better representation of sea lamprey distribution in England than the 2007 map. This said, sea lamprey cannot be surveyed as part of routine, general fishery surveys, and the distribution still appears spuriously patchy. However, the lack of records in the central north-south spine of England (i.e. the headwaters of most catchments) is likely to be an accurate reflection of upstream limits of access and habitat suitability.

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	**"Bellflask Ecological Survey Team (2012) Survey of adult sea lamprey spawning in the Rivers Ure, Swale, Wharfe, Nidd and Derwent, 2003-11. Report for the Environment Agency North East Region.** **A.D. NUNN*, J.P. HARVEY, R.A.A. NOBLE and I.G. COWX (2008) Condition assessment of lamprey populations in the Yorkshire Ouse catchment, north-east England, and the potential influence of physical migration barriers. Aquatic Conservation: Marine and Freshwater Ecosystems 18: 175–189.** **DAVIES, CE, SHELLEY, J, HARDING, PT, MCLEAN, IFG, GARDINER, R AND PEIRSON, G (eds.). 2004. Freshwater fishes in Britain. The species and their distribution. Harley Books, Colchester.** **HARVEY J AND COWX I. 2003. Monitoring the River, Brook and Sea Lamprey, Lampetra fluviatilis, L. planeri and Petromyzon marinus. Conserving Natura 2000 Rivers Monitoring Series No. 5, English Nature, Peterborough. Http://www.english-nature.org.uk/lifeinukrivers/publications/lamprey_monitoring.pdf** **MAITLAND, PS. 2003. Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers, Ecology Series No. 5. English Nature, Peterborough. Http://www.english-nature.org.uk/LIFEinUKRivers/publications/lamprey.pdf** **APEM (1996) A survey of selected English rivers for lamprey 112 pp APEM Stockport Manchester UK** **APEM (1998) Lamprey survey of the River Nadder 21 pp APEM Stockport Manchester UK** **APEM (1997) Proposed Carlisle northern relief road: lamprey habitat survey and population survey 25 pp APEM Stockport Manchester UK** **APEM (1998) A survey of the western arm of the upper River Avon for lamprey. 17 pp English Nature, Peterborough** **APEM (1997) A survey of the upper River Avon for lamprey. 35**

pp English Nature, Peterborough

MAITLAND, PS. 1980. Review of the ecology of lampreys in northern Europe. Canadian Journalof Fisheries and Aquatic Sciences. 37, 1944-1952.

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	
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	**stable**	
	Recording effort has increased considerably over the short-term trend period for range, and it is not possible to distinguish between this and real extensions of range. It is likely that much of the apparent increase in range is due to increased recording effort, although there have been real improvements in the water quality of north east estuaries (Humber, Tees, Tyne and Wear, and so there may be a real range extension in this area and possibly elsewhere (e.g. the Mersey).	
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	**stable**	
	Most impacts on lamprey range are historical and pre-date the long-term range period. As with short-term trends in range, changes in recording effort interfere with the ability to identify any positive trend.	
2.3.8 Long-term trend Magnitude Optional	**a) Minimum**	
	b) Maximum	
2.3.9 Favourable reference range	**a) Value in km²**	
	Current range was used as a minimum estimate of favourable reference range in the last reporting round. However, due to improved reporting and possibly some real reoccupation of some historical range, the range in England has increased substantially. Current range is now a more suitable minimum estimate of favourable reference range in England, although considerably less than the historical range due to impacts on migration routes that pre-date the trend periods considered in this report.	
	b) Operator for FRR	**more than**
	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?	**True**
	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 1x1 km grid cells**
	b) Minimum	**115**
	Only a minimum estimate can be provided due to the level of under-recording at 1km square resolution. It is likely that the real population size using this unit is substantially greater. In terms of individuals, it is known from Environment Agency observations that the numbers of returning adults are much higher on many western England rivers (particularly the River Wye SAC and River Eden SAC) than on eastern England rivers (such as the Ouse, Tyne, Wear and Thames). These eastern rivers are all impacted by barriers to migration and spawning populations are typically halted at the most downstream weir.	
	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	**It was not possible to estimate the total number of individuals as the species is very widespread, the survey techniques required are specific to the species and there is consequently no strategic monitoring programme in place to make an estimate. Some estimates of numbers of spawning adults have been made in some river systems, e.g. the Yorkshire Ouse and Derwent systems, butr not consistently across the extensive range of the species.**
2.4.4 Year or period	**1990-2012**	
2.4.5 Method used Population size	**Estimate based on partial data with some extrapolation and/or modelling**	
2.4.6 Short-term trend Period	**2001-2012**	
2.4.7 Short-term trend Trend direction	**unknown**	
	Population trend is unknown but is probably at least stable over the short-term trend period. Most of the artificial physical barriers to upstream migration that have blocked passage to historical spawning grounds are still in place and unmitigated in respect of sea lampreys, although work is underway to address many of them. The water quality of a number of English estuaries has improved in recent years, and this may have improved numbers of migrating adults to these rivers. Results for the Ouse system show that the strength of the adult migration is dependent on adequate flows down the river, which is likely to at least partly relate to the flow needed to pass key artificial barriers. River lamprey appear to be handling these barriers better than sea lamprey, possibly because of their earlier upstream migration. The numbers of sea lamprey ammocoetes in the Ouse system are known to be correspondingly low from ammocoete surveys.	
2.4.8 Short-term trend Magnitude	**a) Minimum**	
	b) Maximum	
	c) Confidence interval	

2.4.9 Short-term trend Method used	**Estimate based on expert opinion with no or minimal sampling**	
	Some estimates of numbers of spawning adults have been made in some river systems over much of the short-term trend period (e.g. the Yorkshire Ouse and Derwent systems), but not consistently across the extensive range of the species to allow a trend assessment.	
2.4.10 Long-term trend – Period	**1989-2012**	
2.4.11 Long-term trend Trend direction	**unknown**	
	The comments in 2.4.7 apply equally here.	
2.4.12 Long-term trend Magnitude Optional	**a) Minimum**	
	b) Maximum	
	c) Confidence interval	
2.4.13 Long term trend Method used	**1**	
2.4.14 Favourable reference population	**a) Number of individuals/agreed exceptions/other units**	
	b) Operator	**much more than**
	c) FRP is unknown indicated by "true"	**False**
	It is not possible to estimate the reference population size using the chosen unit (i.e. number of occupied 1km grid cells) with the information available. However, reference population size is likely to be considerably greater than current population size as measured by 1km grid cells.	
	d) Method used to set FRP	
2.4.15 Reason for change Is the difference between the	**a) Genuine change?**	**False**

value reported at 2.4.1 or 2.4.2 and the previous reporting round mainly due to:		
	b) Improved knowledge/more accurate data?	**False**
	c) Use of different method (e.g. "Range tool")?	**True**

2.5 Habitat for the species		
2.5.1 Area estimation		
	It has not been possible to generate an estimate of habitat area. A systematic survey of the current upstream limit of spawning activity in each occupied river system in England would be required to make a robust estimate. Although no estimate is available, the total area of accessible habitat is likely to be considerably smaller than the historically accessible habitat area due to physical and water quality barriers to migration.	
2.5.2 Year or period		
2.5.3 Method used Habitat for the species	**Absent data**	
2.5.4 Quality of the habitat	**a) Habitat quality**	**Moderate**
	Sea lamprey require coarse, well aerated substrates for spawning and egg incubation, aerobic silt beds in which ammocoetes can grow and mature, good water quality and unimpeded access to spawning beds. The English river network suffers from a range of impacts that interfere with the provision of these conditions. Physical barriers to adult migrations to historical spawning beds are a major issue for the species, but loss or silting of coarse substrates, loss of physical habitat complexity leading to lack of silt beds for ammocoetes, and poor water quality are also significant issues. The Article 17 report on H3260 provides a reasonable basis for characterising habitat quality for P marinus, since H3260 is a widespread habitat in England and the natural range of P marinus is also wide. However, the H3260 report addresses general river habitat quality and is not specifically focused on the habitat quality required for P marinus. Key points from the H3260 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 length timescales needed to resolved 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 ges in the 2009 WFD baseline assessment, and only 4 waterbodies were at 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**	
	Progress has been made with reducing nutrient and organic pollution levels in many rivers across England within the short-term trend period, which should have a beneficial effect on the quality of spawning and ammocoete substrates. Water quality improvements in a number of estuaries is also likely to facilitate passage to spawning grounds. However, progress with tackling siltation of spawning beds, physical barriers to migration and physical habitat degradation are still in their early stages.	
2.5.7 Long-term trend Period	**1989-2012**	
2.5.8 Long-term trend Trend direction	**increase**	
	Progress has been made with reducing nutrient and organic pollution levels in many rivers across England within the long-term trend period, which should have a beneficial effect on the quality of spawning and ammocoete substrates. Water quality improvements in a number of estuaries is also likely to facilitate passage to spawning grounds. However, progress with tackling siltation of spawning beds, physical barriers to migration and physical habitat degradation are still in their early stages.	
2.5.9 Area of suitable habitat for the species	**a) Value in km²**	
	As with the estimation of current habitat area, it is not possible to make an assessment of potentially suitable habitat with available data.	
	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 H = high importance M = medium importance L = low importance	c) Pollution qualifier
J02: human induced changes in hydraulic conditions	H	
J03: Other ecosystem modifications	H	
H01: Pollution to surface waters (limnic & terrestrial, marine & brackish)	M	X
F02: Fishing and harvesting aquatic resources	L	

F02 - There is no commercial exploitation of sea lamprey in river systems in England. Sea lamprey are opportunistic in their parasitisation of prey species in the marine phase - fluctuations in abundance in prey are likely to cause predator-prey interactions and influence abundance of lamprey, and exploitation of prey species may therefore have a bearing on sea lamprey populations.

H01 - Pollution sources include nutrients and organic pollution from domestic sources, nutrients and fine sediment from agriculture, and industrial pollution. However, pollution from domestic and industrial sources is declining as measures are progressively taken. Major initiatives on agricultural pollution should generate reduced diffuse pollution loads.

J02 - Artificial modifications to river channels and flow regimes can affect hydraulic conditions in ways that increase siltation of spawning gravels, reduce the extent and quality of ammocoete beds and interfere with spawning migrations. Such modifications are extensive in England.

J03 - Artificial physical barriers obstruct migration routes in many river systems. This can result in impaired access or complete obstruction.

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	
J02: human induced changes in hydraulic conditions	H	
J03: Other ecosystem modifications	H	
F02: Fishing and harvesting aquatic resources	M	
H01: Pollution to surface waters (limnic & terrestrial, marine & brackish)	M	X

M01: Changes in abiotic conditions	M	

All of the pressures listed in 2.6 are set to continue into the future, although on-going or planned action on some of them should lessen their impact. In addition, climate change is likely to increase the frequency of extremes in flow regimes, which may affect spawning migrations and the suitability and extent of ammocoete beds. There may be increasing pressure for exploiting sea lamprey populations in the future if adult run sizes are restored. However, regulatory mechanisms are now in place to control any such threat (see 3.2).

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**	**number of map 1x1 km grid cells**
	Sea lamprey is a widespread species in England and the SAC river network can only provide representative coverage of the species across its natural range. The SAC river network includes a number of important populations of sea lamprey.	
	b) Minimum	**30**
	Only a minimum estimate can be provided due to the level of under-recording at 1km square resolution. It is likely that the real population size using this unit is substantially greater.	

	c) Maximum	
	No maximum estimate is available.	
3.1.2 Method used	**Estimate based on partial data with some extrapolation and/or modelling**	
3.1.3 Trend of population size within the network (short-term trend)	**stable**	
	Whilst the number of records within the English SAC river network has increased since the last reporting round (particularly in the River Eden SAC), it is likely that this is due to increased recording effort rather than an expansion of range and population.	

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
4.0: Other wetland-related measures		Y	Y	Y	Y	H	Y				Y	Y			
4.1: Restoring/improving water quality	Y	Y	Y	Y	Y	M			Y		Y	Y			
4.2: Restoring/improving the hydrological regime	Y				Y	H	Y				Y	Y			
6.3: Legal protection of habitats and species	Y					H			Y						Y

7.2: Regulation/ Management of fishery in limnic systems	Y					L			Y						Y

Within the English river SAC network, and to a lesser extent the wider network of nationally designated rivers, considerable effort has been expended on the development and implementation of strategic plans aimed at restoring the condition of the river habitat (see Mainstone and Clarke 2008 in 2.2 for an explanation of the strategy adopted). Beyond the designated site network, management measures for restoring river habitat are largely governed by the Water Framework Directive. Within the first round of river basin management planning, a considerable amount of WFD-related effort is being expended on confirming, and investigating the causes of problems with, ecological status. Better harmonisation of plans and activities under the WFD and Habitats Directive is needed (see Mainstone 2008 in 2.2 for further discussion of harmonisation issues).

An account of each type of conservation measure is given below.

4.0 Since the last Article 17 report, a major programme of physical restoration has been implemented on the SAC and domestic SSSI river network, involving the development of a long-term strategic plan for each river and its programmed implementation over suitable timescales (see references in 2.2 for details of the programme). These plans address key issues such as dams and weirs, channelisation, flood embankments, bank reinforcements, lack of riparian habitat, lack of riparian trees and lack of woody debris in the channel. The development and implenmentation of these plans is providing an important strategic focus for river restoration on the designated river network, and is valuable in promoting a strategic approach on the wider river network. Outside of the designated site network, practical measures have focused on addressing the many weirs and dams on the river network in England. The general WFD aim is to remove problem structures where possible, or to reduce their impacts on fish migration.

4.1 Work has continued to implement the review of discharge consents affecting the Natura network in England. Further phosphorus removal processes have been fitted to sewage effluents under the water industry's programme of strategic improvements. In respect of discharge consents affecting river SACs, 108 are being modified, 7 are being revoked and one is being surrendered. However, further investigations are needed into the application of new best available technology for phosphorus removal, as well as the need for action on rural unsewered populations. Plans are being drawn up for addressing these issues in relation to SACs and nationally designated sites.

In relation to agricultural pollution, the England Catchment Sensitive Farming Initiative is continuing to promote a range of best agricultural practices to reduce pollution loads to priority aquatic sites, including a range of river SACs and nationally designated rivers (see link in 2.2 for further details). The initiative is voluntary and uses awareness-raising and incentives to bring about management change. Modelling has predicted benefits in terms of reduced pollution loads, but it is still unclear how far a voluntary approach will go towards achieving favourable conditions for the habitat.

4.2/4.3 The review of abstraction licences affecting the Natura network in England has been completed. In respect of those licences affecting river SACs, 10 are being served closure notices, 111 are being modified, 15 are being revoked and 9 are being surrendered. However, agreement is needed on further action on abstraction to ensure that the flow regime of SAC rivers and other nationally designated rivers are properly protected.

6.3/7.2 Since the Article 17 last reporting round, the Marine and Coastal Access Act 2009 has been enacted that enables the licensing and control of exploitation of all migratory lamprey. Byelaws can be established to limit the taking of lamprey (through close seasons) Emergency byelaws can also be established to prevent harm occurring or like to occur to lamprey. Since these is currently no

exploitation pressure on sea lamprey in England, no byelaws have so far been established.