

A baseline survey of juvenile lamprey populations in the River Feale catchment



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DEPARTMENT OF THE ENVIRONMENT, HERITAGE
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A baseline survey of juvenile lamprey populations in the River Feale catchment

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Executive Summary

- Three indigenous species of lamprey occur in Ireland; the non-parasitic resident brook lamprey *Lampetra planeri*, the parasitic anadromous river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus*. All three species are listed under Annex II of the European Union Habitats Directive (92/43/EEC). This Directive requires the Irish Government to designate Special Areas of Conservation (SACs) and to maintain the favourable conservation status of these species.
- As part of ongoing assessments of Annex II species in Ireland, the National Parks and Wildlife Service (NPWS) commissioned a survey of juvenile lamprey populations in the Feale catchment. This survey was undertaken by Ecofact Environmental Consultants Ltd. during August / September 2005.
- A total of 56 sites were sampled using semi-quantitative electrical fishing methods. Quantitative assessments were undertaken at an additional three sites. Physical habitat measurements were also recorded at each area investigated. Lampreys (n= 635) were present at 19 out of the 59 sites investigated (32.2%). It is thought that all three Irish species of lamprey occur in the Feale catchment. However, brook lamprey juveniles cannot be distinguished from young river lampreys in the field.
- Mean minimum densities of river/brook and sea juveniles recorded was 0.37 ± 0.27 per m² and 1.27 ± 0.79 per m² respectively. Standard length of juvenile sea and river/brook lampreys recorded ranged from 4.2 cm to 17.7 cm and 1.6 cm to 17.7 cm respectively. The efficiency of capturing young of the year larvae (YOY) was considered to be low due to their small size.
- Juvenile lampreys have a restricted distribution in the Feale catchment and are present at lower densities than in other Irish Rivers surveyed by NPWS to date. The Feale is a high gradient spate catchment subject to significant floods. This favours the creation of habitats more suited to salmonids. Several areas of the catchment have been subjected to arterial drainage works and this may also have affected lamprey populations in the catchment (i.e. in the Galey).
- The main lamprey populations in the Feale catchment are currently protected within the existing SAC boundary area and no recommendations are made to extend the boundary area.

1 INTRODUCTION

Three species of lamprey occur in Ireland; brook lamprey *Lampetra planeri*; river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus*. All three Irish lamprey species are listed under Annex II of the European Union Habitats Directive (92/43/EEC). This directive legally protects each of these species in designated Special Areas of Conservation (SACs) and requires the monitoring and protection of lamprey species coupled with the conservation and maintenance of their preferred habitat. The National Parks and Wildlife Service (NPWS) of the Department of Environment, Heritage and Local Government are currently undertaking surveys in all of the Irish River SACs. Since 2000, catchment-wide studies have been completed on the Slaney, Munster Blackwater, Moy, Barrow and Boyne.

The current survey concerns the Feale catchment and was undertaken during the period August/September 2005. The assessment involved electrical fishing investigations at 55 sites throughout the catchment. The aims of the current investigation were to:

- To establish the abundance and distribution of lamprey species in the River Feale catchment;
- To determine the age structure of the populations present in order to assess production levels;
- To determine the distribution of the main nursery sites in relation to habitat types and vegetation to facilitate decisions with regard to habitat management.

This study was undertaken by Ecofact Environmental Consultants Ltd. on behalf of the National Parks and Wildlife Service.

2 METHODOLOGY

2.1 Selection of sites

Sections of river channel near existing EPA water quality sampling stations were assessed for the presence of juvenile lamprey habitat during an initial walkover survey. Juvenile lamprey habitat was identified from the descriptions given in Maitland (2003). Such sections generally had fine-grained bed material and have a water depth suitable for wading. When available, an area of up to 10 m² was selected for surveying in the vicinity of each EPA water quality station. In many areas, it was difficult to locate suitable larval lamprey habitat. In some cases, fragments of habitats spread over more than 100 m were assessed as a single site.

2.2 Electrical fishing assessment

Sites were investigated using electrical fishing. This is a well-established technique for sampling fish populations in freshwater (Lagler, 1978; Reynolds, 1983; Bohlin *et al.*, 1990). When an electric current is passed through water, a fish within the electrical field will turn and swim towards the anode (known as the anodic effect). This mechanism is referred to as electrotaxis and fish may be stunned (electronarcotisation) as it reaches the anode. A dip net is then used to retrieve the fish from the water.

A Smith-Root LR-24 portable electrical fishing unit was employed during this survey. The LR-24 set is powered by a 24v sealed battery and delivers a 50 to 990 Volt output in 5 volt steps. This machine can automatically set voltage and power to the pertaining site conditions (conductivity, water depth). This automatic set up routine was used during the current survey to ensure that a constant effort was applied at each site. The anode handle consists of fibreglass and is equipped with a safety switch, a steel ring shaped electrode (diameter 300 mm). The steel ring electrode was fitted with a fine mesh net (1 mm) to facilitate lamprey collection. The cathode, consisting of three wires, was allowed to trail behind the operator. The operators (2 persons) wore insulated chest waders. The machine was secured on the back of one operator who also held the anode. An assistant held an insulated dip net (mesh size 1mm; 40 cm x 40 cm frame, handle length 182 cm) for collecting lampreys that failed to be captured by the operator.

The sampling approach permitted the recording of presence/absence data, as well as facilitating collection of population structure and minimum density data. Sampling areas at each site were fished in a zigzag manner. The area fished at each site varied depending on the extent of fine-grained bed material and suitable water depth available. A fishing operation started with the gear constantly 'on' followed by a regular on/off sequence. While the gear is 'on' the anode was slowly pulled backwards in the water to cause lampreys to emerge from burrows as a result of electro-taxis. This procedure was repeated throughout the operation. By keeping the anode 1-15 cm above the sediment and pulling the anode backwards, the number of lampreys stunned within the substrate was reduced. Captured lampreys (and other fish) were removed quickly using the anode net or dip net and placed into a container of river water. Surveys were completed after 20 minutes continuous fishing (or earlier if large quantities of lampreys are encountered or if there was a paucity of suitable and accessible habitat at the site). After each survey is completed, all captured fish were anaesthetised using a solution of Phenoxyethanol. Bycatch species captured at each site were counted. Lampreys were measured to the nearest millimetre (standard length), weighted to the nearest 0.1g and identified using the keys given in Gardiner (2003).

The following equipment was utilised in the assessment:-

- Portable bench and chair
- Soft fine-meshed net
- Bendy stainless steel tweezers
- Measuring board
- Ohaus Portable scales (0.1g)
- Smooth white Formica board
- Headband magnifier and hand lenses
- Vernier micrometer.

Subsequent to examination, all fish were allowed to recover in a container of river water. All fish were released alive and spread evenly over the sampling area. Results of the investigations are presented using two CPUE indices (lamprey number m⁻², and lamprey weight (biomass) m⁻²).

2.2.1 Quantitative electrical fishing assessment

A total of three sites were selected for quantitative assessment. These sites were closed off using heavy duty fine mesh stop nets with bottom weights and floats. These sites were at least 5 m in length and 1 m wide, depending on the characteristics of the site. Electrical fishing within the enclosures was the same as described above. Three passes were made in each enclosure, with a fifteen-minute rest period after each sampling effort. Fish from each pass were retained separately for identification, enumeration and measurement of length and weight. On completion of the electric fishing, a steel framed net was used to scrape through the upper 50-100 mm of sediment in each enclosure. This process served to ascertain the presence of further juveniles, including the very small young-of-the-year. Minimum densities were calculated using the Leslie-Davies Method. Results of the electrical fishing investigations are presented as a minimum density estimate (number and biomass m⁻²).

2.3 Description of sites

Following completion of the fishing the dimensions and physical habitat characteristics of each site were recorded. The following general physical habitat characteristics of the stretch of river where the site was located were recorded: -

- | | | |
|----------------------|------------------------|-------------------------------|
| • Wetted width (m) | • Bank slope (degrees) | • Rock substrate (%) |
| • Bank height (m) | • Riffle (%) | • Cobble/Rubble substrate (%) |
| • Mean depth (cm) | • Glide (%) | • Gravel substrate (%) |
| • Maximum depth (cm) | • Pool (%) | • Fine substrate (%) |
| • Bank cover (%) | • Vegetation cover (%) | • Flow (m sec-1) |
| • Canopy cover (%) | • Shade (%) | • Bank slope (degrees) |

Flow measurements were carried out using a *Geopacks* mechanical flow meter and wading rod. The following physical habitat characteristics were recorded for the area fished:-

- Mean depth (cm)
- Sand (%)
- Silt (%)
- Clay (%)
- Density (index)

- Shade (%)
- Rooted Vegetation Cover (%)
- Flow ($\text{m}^3 \text{sec}^{-1}$)

Other general characteristics such as the presence of larger materials (cobbles etc.) and the presence of organic material were also recorded. Site photographs (of river channel and actual area fished) were taken with a 4MP Nikon digital camera and site location was recorded with a handheld GPS unit (Garmin Geko 301). Conductivity and water temperature were measured on site using an Oakton Acorn Con 5 handheld meter. Dissolved oxygen was measured at selected sites using a YSI portable meter.

2.4 Identification of lampreys

Lampreys were identified in the field using the key provided by Gardiner (2003). Identifications were made with reference to external pigmentation and occasional myomere counting. All lampreys captured in the current survey were released as it was designed as a non-destructive assessment.

2.5 Assessment of conservation status

Harvey & Cowx (2003) have proposed a methodology for assessing the conservation status of lampreys in British Rivers using information on abundance classification, population structure and distribution. In the absence of a scheme for Irish Rivers this scheme is referred to in the current report. The scheme is given in Table 1.

Table 1 Methodology for assessing the conservation status of lampreys in British Rivers using information (adapted from Harvey & Cowx, 2003)

Abundance classification

The first approach classifies the density of lamprey ammocoetes in order to define the relative condition of fish populations in rivers. This assessment is based on two measures – the first a density estimate based on optimal habitat, and the second a density estimate based on catchment-wide surveys that will include a diversity of habitats. The attributes for compliance with favourable status are tentatively set at:

Optimal habitat

- Population density river/brook lamprey ammocoetes $>10 \text{ m}^{-2}$
- Population density river/brook lamprey ammocoetes chalk streams $>5 \text{ m}^{-2}$
- Population density sea lamprey ammocoetes 0.2 m^{-2}

Catchment perspective

- Population density river/brook lamprey ammocoetes $>2 \text{ m}^{-2}$
- Population density sea lamprey ammocoetes 0.1 m^{-2}

Abundances less than these targets indicate rivers/reaches/sites in unfavourable condition. It is important that an appropriate number of sites are surveyed to account for natural spatial variation in lamprey population size in the SAC rivers under examination.

Population demographic structure

A second assessment can be made of the demographic structure of the population – that is, the contribution of different age classes to the population to demonstrate recruitment success. To achieve favourable conservation status, where abundant, river and brook lamprey ammocoete populations should have at least two age classes in the populations sampled from optimal habitat. Deviation from compliance should not occur in more than one year in three.

Distribution

Further assessment of the status of lampreys can be derived from mapping their distribution in individual SAC rivers. Compliance with favourable conservation status should be recorded if there is no decline in distribution of ammocoetes from the current, or where available, historical pattern. This distribution pattern should be linked to favourable habitat status, whereby no deterioration in habitat quality is registered.

3 STUDY AREA

3.1 The Feale catchment

The River Feale (OS catchment 194, EPA Code 23/F/01) rises in the mountains of north Cork, near Rockchapel, and flows for approximately 74 km through the towns of Abbeyfeale and Listowel before entering the sea at Ballybunion. The catchment area is 1,165 Km² and derives its flow principally from runoff. It is therefore typically a fast flowing spate river subject to huge floods (O'Reilly, 2004). The lower reaches of the river are known as the Cashen River. The river is tidal up to Finuge Bridge downstream of Listowel. The Feale catchment indicating the major towns in the area is presented in Figure 1.

The tributaries of the Feale are the Galey (42 km) and the Brick (11 km) which enter the river downstream of Listowel, the Smearlagh (22.5 km), Oolagh (12.5 km), and Allaghan (23 km) which enter downstream of Abbeyfeale and the Owveg (11 km), Clydagh (9.5 km), Breanagh (5.5 km) and Caher (4 km) which join the upper reaches of the Feale. Water quality in the catchment is generally good with 85% of the 207 km of channel surveyed by the EPA during the period 1998-2000 classified as Class A - unpolluted (McGarrigle *et al*, 2002). Pollution problems have been recorded on the middle and lower reaches of the Galey and on the main channel of the Feale downstream of Listowel and at Abbeyfeale. A summary of EPA water quality results from the catchment is given in Table 1.

The Feale is one of the most important sea trout fisheries in Ireland and is also known as a salmon fishery. Indeed, O'Reilly (2004) estimates as many as 2,000 sea trout and 1,500 salmon can be caught on the river each year. It is generally an unmodified river. However, arterial drainage works have been undertaken on the Galey and other parts of the catchment. A large weir is present in the lower reaches of the river at Finuge and this may have caused fish passage problems in the past. A new fish pass was installed at this site in recent years.

Table 1 Summary of water quality results from the Feale catchment. Data is from EPA biological surveys during the period 1998-2000 (adapted from McGarrigle *et al*, 2002).

Catchment	Class A	Class B	Class C	Class D
Allaghan (km)	23.0			
Breanagh km)	5.5			
Brick (km)	10.5	0.5		
Caher (km)	4.0			
Clydagh (km)	9.5			
Feale (km)	45.5	3.0	11.5	
Galey (km)	26.0	11.5	4.5	
Glashacoocore (km)	6.0			
Oolagh (km)	12.5			
Owveg (km)	11.0			
Smearlagh (km)	22.5			
Total (km)	176	15	16	0
Total (%)	85.0	7.2	7.7	0.0



Plate 1 The River Feale downstream of Duagh Bridge.



Plate 2 Semi-quantitative electrical fishing on sub-optimal habitat.



Plate 3 Quantitative electrical fishing site on optimal habitat.

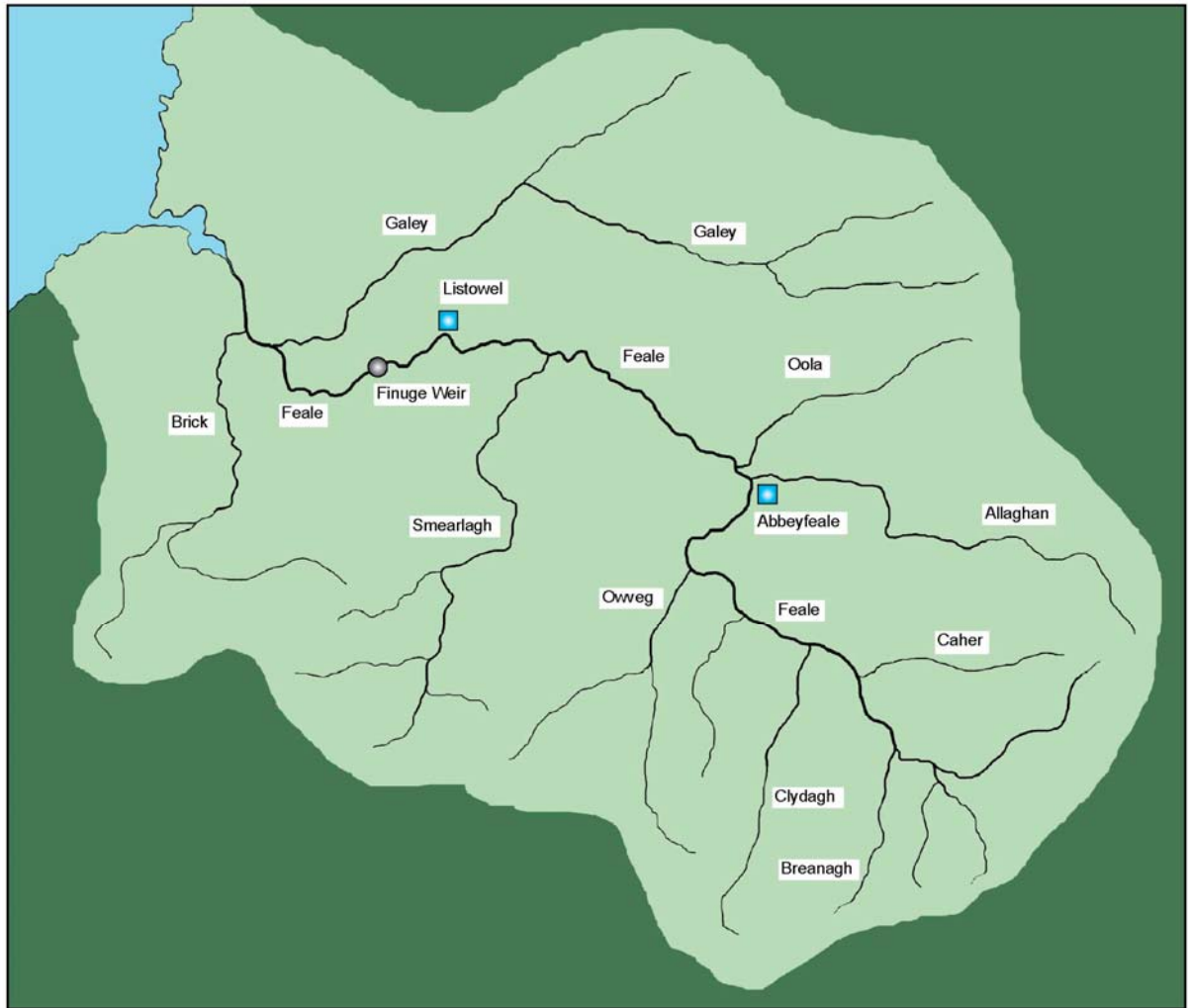


Figure 1 The Feale catchment.

4 RESULTS

A total of 59 sites comprising of a total of 410 m² were investigated using electrical fishing during August/September 2005. A total of 20 sites were investigated on the main channel of the River Feale. The location of all areas investigated is presented in Figure 2 (page 13) and a list of the areas surveyed is provided in Appendix 1.

4.1 Electrical fishing site characteristics

Sites investigated were located throughout the catchments and were distributed at altitudes from near sea level to 250 m a.s.l. The wetted width of channels investigated ranged from 2 to 65 m while depths ranged from 1 cm to <200 cm. Water quality in most of the areas investigated has recently been recorded as being unpolluted by the EPA during their 2003 biological survey (EPA, 2004). The mean depth of the areas surveyed for juvenile lampreys was 17.4 cm. Mean flow in the areas surveyed was 1.14 cm sec⁻¹ and ranged from slight negative flows to 8.0 cm sec⁻¹. Almost half of the sites surveyed had no measurable flow and one intertidal area was investigated. The overall composition of fine material surveyed at the 59 sites was 54.86 % sand, 36.72 % silt and 8.41 % clay. The average area fished was 6.95 m² (Minimum 2 m², Maximum 30 m², Standard Deviation 4.43). Areas were fished for

a minimum of one minute per m² and up to five minutes per m² when significant numbers of lampreys were present.

4.2 Lamprey catch

A total of 634 lampreys weighing a total of 1.68 Kg were recorded during the current survey. A total of 115 (18.1%) were identified as being sea lampreys. Overall, a total of 36 lampreys captured during the current survey were identified as being transformers. These included individuals identified as being both brook/river and sea lampreys. A significant number of the transformers recorded broadly corresponded to the “*silvered, slender looking, and laterally flattened. Prominent eye (eye length often 2.4 to 2.8% of total length). May have sharp teeth. Lateral line organs on and around the head generally not conspicuous. No signs of sexual maturation. Less than 120 mm, and typically 90–115 mm*” description of river lamprey transformers given by Gardiner (2003) and it is tentatively concluded that at least some of these specimens were *Lampetra fluviatilis*. However, Gardiner (2003) also notes that “*It may not be possible to distinguish the two species [of Lampetra] unambiguously in the field, particularly up to early winter*”.

4.3 Distribution, abundance and characteristics of lamprey populations

The distribution of juvenile lampreys at the 59 sites investigated during the 2005 survey is illustrated in Figure 2. The length percentage frequency distributions of juvenile brook/river and sea lampreys recorded from the main channel of the River Feale are given in Figures 3 and 4 respectively. Figures 5, 6 and 7 show the length percentage frequency distributions of brook/river and sea lampreys respectively recorded from the Feale tributaries. Standard length of juvenile sea and river/brook lampreys recorded ranged from 4.2 cm to 17.7 cm and 1.6 cm to 17.7 cm respectively.

Mean minimum densities of river/brook and sea juveniles recorded was 0.37 ± 0.27 per m² and 1.27 ± 0.79 per m² respectively. The mean densities of larvae from each river channel surveyed are given in Table 5. Summary statistics for density (number m⁻²) for each river channel surveyed are provided in Table 6.

Juvenile lampreys have a restricted distribution in the Feale catchment and are present at lower densities than in other Irish Rivers surveyed by NPWS to date. The Feale is a high gradient spate catchment subject to significant floods. This favours the creation of habitats more suited to salmonids. Several areas of the catchment have been subjected to arterial drainage works and this may also have affected lamprey populations in the catchment (i.e. in the Galey). The distribution and characteristics of lamprey populations on the individual river channels is outlined below.

4.3.1 Feale Main Channel

A total of 20 sites were investigated on the main channel of the River Feale. Lampreys were present at 12 (40%) of the sites fished. A total of 97 juvenile sea lampreys and 280 river/brook juveniles were recorded in a total area fished of 165 m². Lampreys were not recorded upstream of the Clydagh confluence and physically suitable lamprey nursery habitat was also generally absent from above this point. The highest densities of lampreys were recorded in the lower reaches of the river (Duagh and Listowel). Sea and river/brook lamprey density was 3.2 m⁻² and 12.8m⁻² respectively at Duagh. Upstream of Duagh Bridge evidence of recent gravel/cobble removal from the river was apparent (see Plate 4, P14). The river was also exhibiting some enrichment at Listowel with a heavy growth of filamentous algae recorded at in the area of the river adjoining Listowel racecourse.

4.3.2 *Brick*

The River Brick and Lixnaw canal was assessed during the preliminary walkover study and no suitable lamprey habitat / electrical fishing sites were found due to poor access. The river was not investigated further.

4.3.3 *Galey*

The Galey (pronounced "Gale") is the largest tributary of the Feale and a total of nine sites were investigated on this river and its tributaries; the Tarmon Stream and the Pound River. Sites were distributed between the Feale confluence and Athea village. No lampreys were detected in the 71 m² investigated. As with the main channel of the River Feale, the Galey is a spate river and erosive floods in the river may prevent lamprey nursery habitat from development. The Galey was also subjected to a particularly invasive arterial drainage scheme during the 1970's and the bed of the river was deepened by as much as 5m in places at this time. This scheme is also likely to have significantly affected the ecology of the river and may explain the apparent absence of lampreys from this river. The site fished at Athea was considered to be physically optimal for juvenile lampreys – however no lampreys were present.

4.3.4 *Smearlagh*

The Smearlagh is the second largest tributary of the Feale and is a renowned sea trout river. This is a rock and cobble strewn spate river and extensive searching along this channel failed to find any optimal lamprey nursery habitats. A total of 4 sites were investigated and all sites were considered to be physically marginal habitats. A total of 3 lampreys were detected in the 25 m² investigated.

4.3.5 *Oolagh*

A total of 5 sites were investigated on the Oolagh River, which joins the Feale at Abbeyfeale, Co Limerick. A total of 32.4 m² of habitat was fished resulting in the capture of 106 lampreys. Lampreys were present at only two of the five sites investigated (40%). A density of 11 lamprey m⁻² was recorded downstream of the bridge at Port.. Sea lampreys were not recorded from this sub-catchment. Gravel removal continues to be a problem in some parts of this river.

4.3.6 *Allaghan*

A total of 6 sites were investigated in this sub-catchment but no lampreys were recorded. Although most of the sites investigated were considered to be sub-optimal habitats for lampreys, one site considered to provide physically optimal habitat was investigated (Site A2). However lampreys were also absent from this site.

4.3.7 *Owveg*

A total of 7 sites (45 m²) were investigated on the Owveg River resulting in the capture of 87 lampreys. Both sea lampreys and brook/river lampreys were confirmed from the catchment. Lampreys were present at only one of the seven sites investigated (14.2%). A density of 8.71 lamprey m⁻² was recorded at the site near Bateman's Bridge. Evidence of gravel removal was noted along a number of areas of this river.

4.3.8 *Clydagh, Caher, Breanagh and Glashaconcore*

These upper tributaries of the Feale are rock and cobble strewn spate streams and extensive searching along these channels failed to find any optimal lamprey nursery habitats. No lampreys were recorded from any of the sites investigated in these sub-catchments.

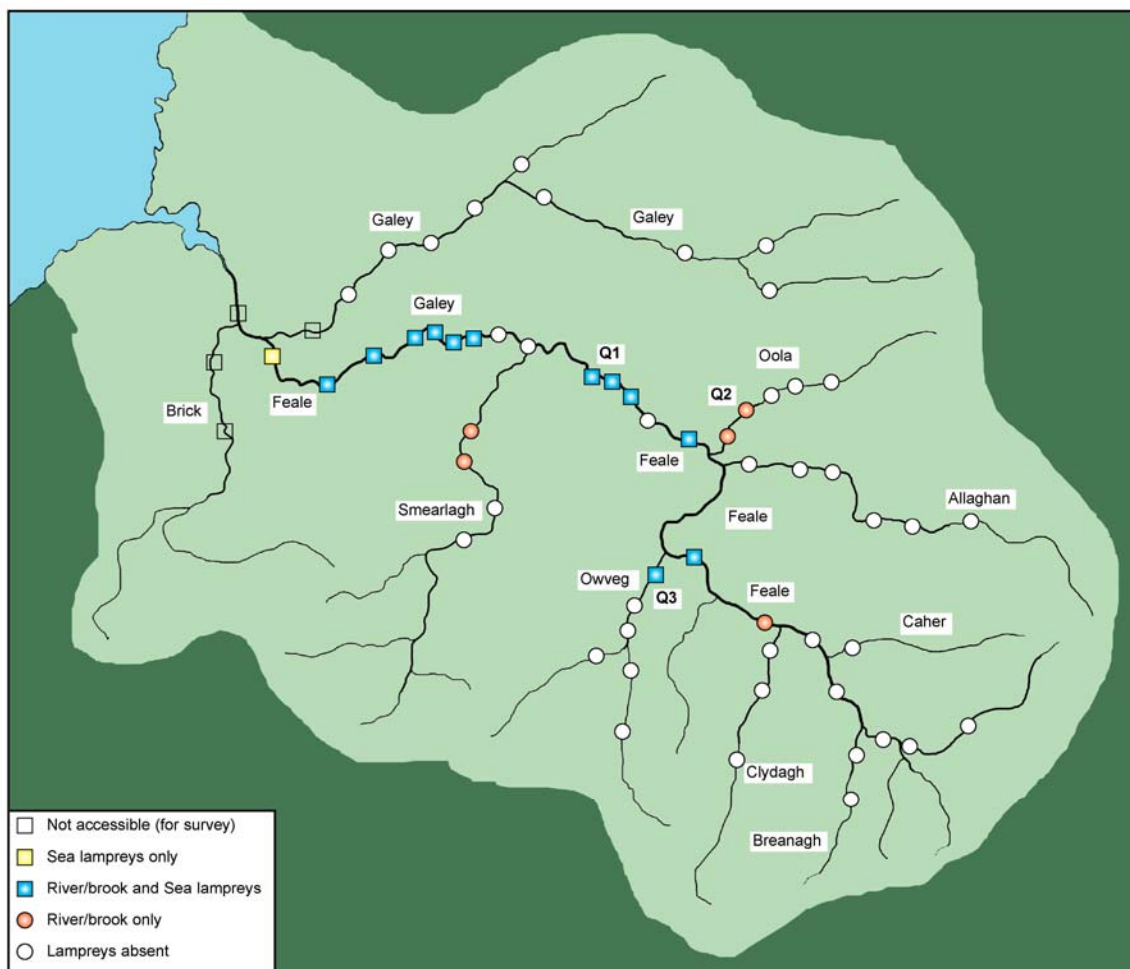


Figure 2 Map of the Feale catchment illustrating the distribution of juvenile lampreys at the 59 sites investigated during the 2005 survey.



Plate 4 Evidence of recent gravel removal on the main River Feale upstream of Duagh Bridge.

Table 2 Mean density of sea lamprey recorded in each river assessed.

River	Tributary	Area fished (m ²)	Density (lamprey m ⁻²)		
			Mean	Minimum	Maximum
Feale		160	0.97	0.00	5.60
Galey		59	0.00	0.00	0.00
Owveg		38	0.57	0.00	2.57
Oolagh		25.4	0.00	0.00	0.00
Allaghaun		25	0.00	0.00	0.00
Smearlagh		25	0.00	0.00	0.00
Clydagh		18	0.00	0.00	0.00
Caher		15	0.00	0.00	0.00
Allaghaun	Iskule Stream	7	0.00	0.00	0.00
Breanagh		7	0.00	0.00	0.00
Galey	Tarmon Stream	7	0.00	0.00	0.00
Oolagh	Knocknasna Stream	7	0.00	0.00	0.00
Owveg	Glena River	7	0.00	0.00	0.00
Lyraneag		5	0.00	0.00	0.00
Galey	Pound River	5	0.00	0.00	0.00

Table 3 Mean density of river/brook lamprey recorded in each river assessed.

River	Tributary	Area fished (m ²)	Density (lamprey m ⁻²)		
			Mean	Minimum	Maximum
Feale		160	2.59	0.00	12.80
Galey		59	0.00	0.00	0.00
Owveg		38	2.95	0.00	9.86
Oolagh		25	4.84	0.00	11.00
Allaghaun		25	0.00	0.00	0.00
Smearlagh		25	0.19	0.00	0.67
Clydagh		18	0.00	0.00	0.00
Caher		15	0.00	0.00	0.00
Allaghaun	Iskule Stream	7	0.00	0.00	0.00
Breanagh		7	0.00	0.00	0.00
Galey	Tarmon Stream	7	0.00	0.00	0.00
Oolagh	Knocknasna Stream	7	0.00	0.00	0.00
Owveg	Glena River	7	0.00	0.00	0.00
Lyraneag		5	0.00	0.00	0.00
Galey	Pound River	5	0.00	0.00	0.00

Table 4 Summary statistics for length (cm) of juvenile sea lampreys from the Feale and Owveg Rivers. Sea lampreys were not recorded in other areas during the current survey.

River	N	Mean	Minimum	Maximum	StDev	Variance	95% C.I.
Feale	91	8.4	4.2	13.1	2.113093	4.46516	0.43
Owveg	24	13.8	8.2	17.7	2.175718	4.73375	0.87

Table 5 Summary statistics for length (cm) of juvenile river/brook lampreys from the Feale, Oolagh, Owveg and Smearlagh Rivers. Lampreys were not recorded in other areas during the current survey.

River	N	Mean	Minimum	Maximum	StDev	Variance	95% C.I.
Feale	286	8.6	4.2	14.6	2.59	6.68	0.30
Oolagh	106	8.5	1.6	16.4	4.05	16.38	0.77
Owveg	124	12.0	5.0	17.7	3.01	9.06	0.53
Smearlagh	3	10.5	9.2	11.5	1.17	1.36	1.32

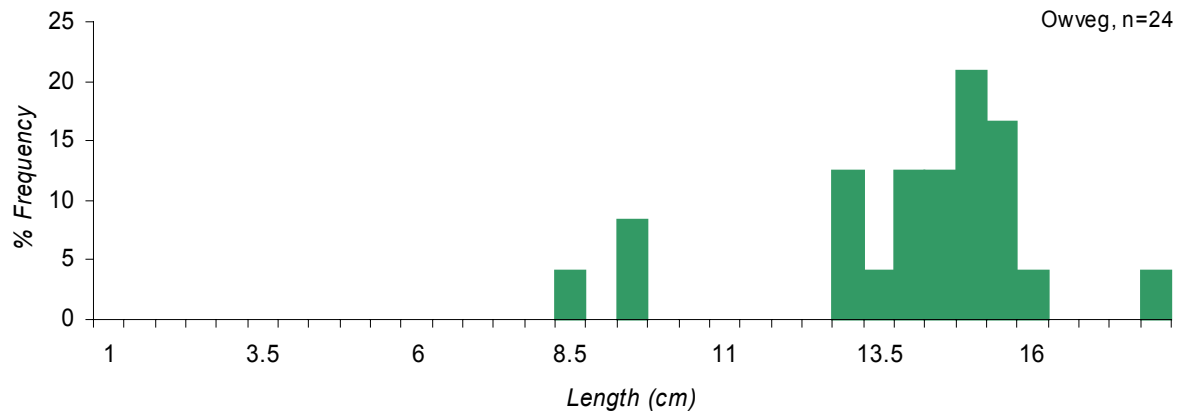
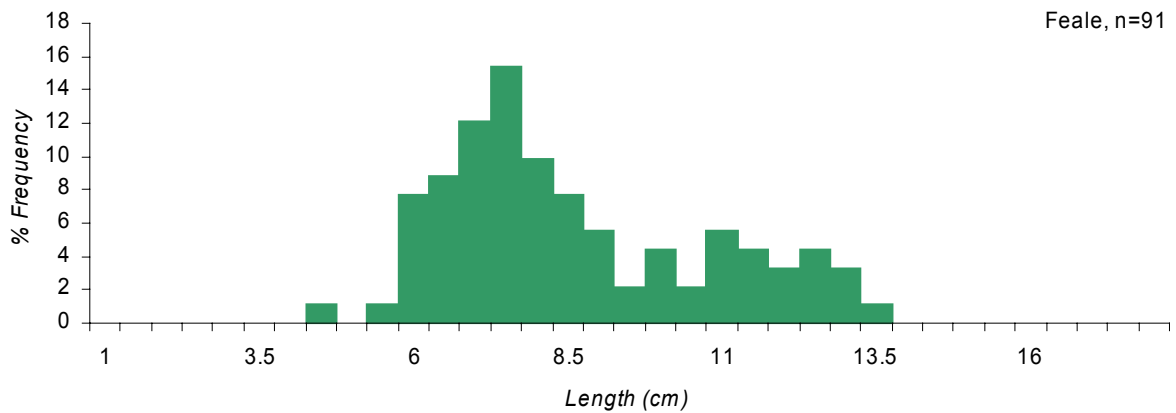


Figure 3 Length percentage frequency distributions of juvenile sea lampreys recorded from the River Feale (main channel) and the River Owveg.

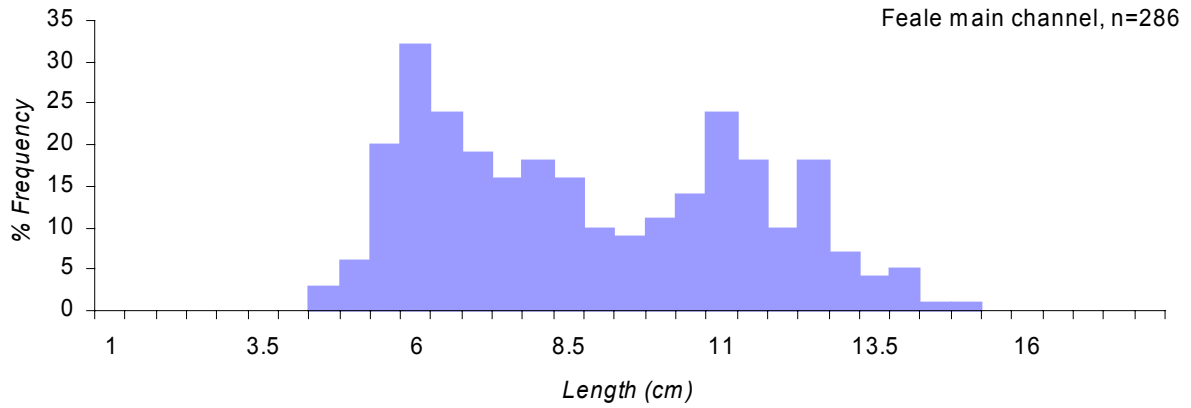


Figure 4 Length percentage frequency distributions of juvenile river / brook lampreys recorded from the main channel of the River Feale.

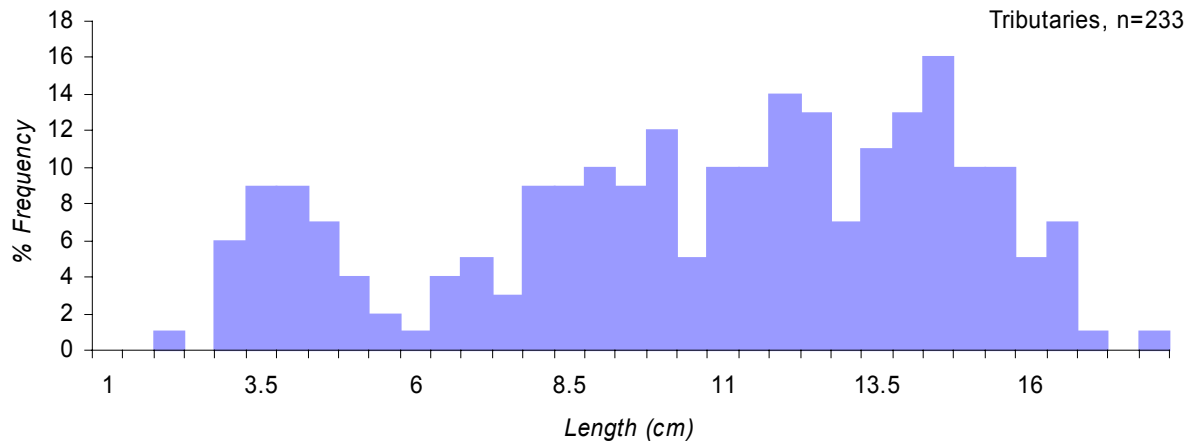


Figure 5 Length percentage frequency distributions of juvenile brook / river lampreys recorded from the Feale tributaries.

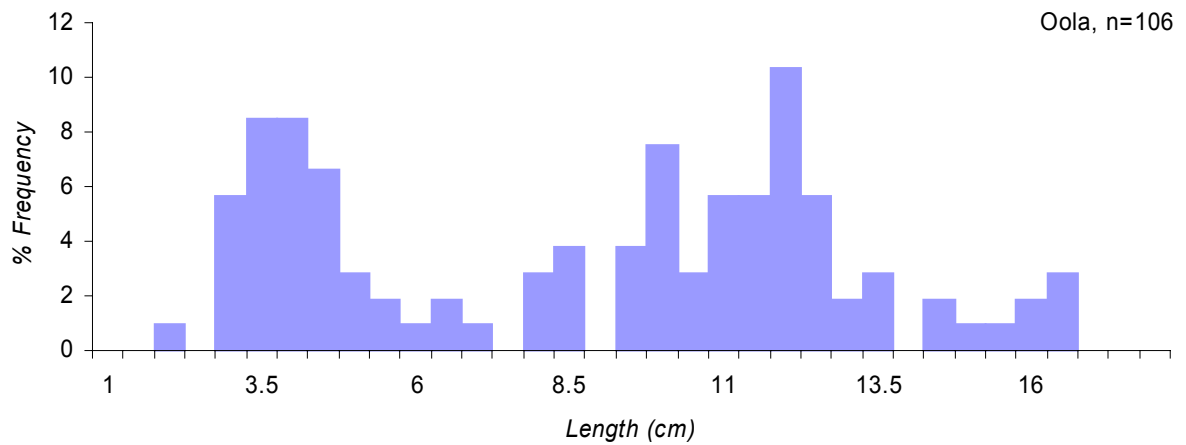


Figure 6 Length percentage frequency distributions of juvenile brook / river lampreys recorded from Oolagh River.

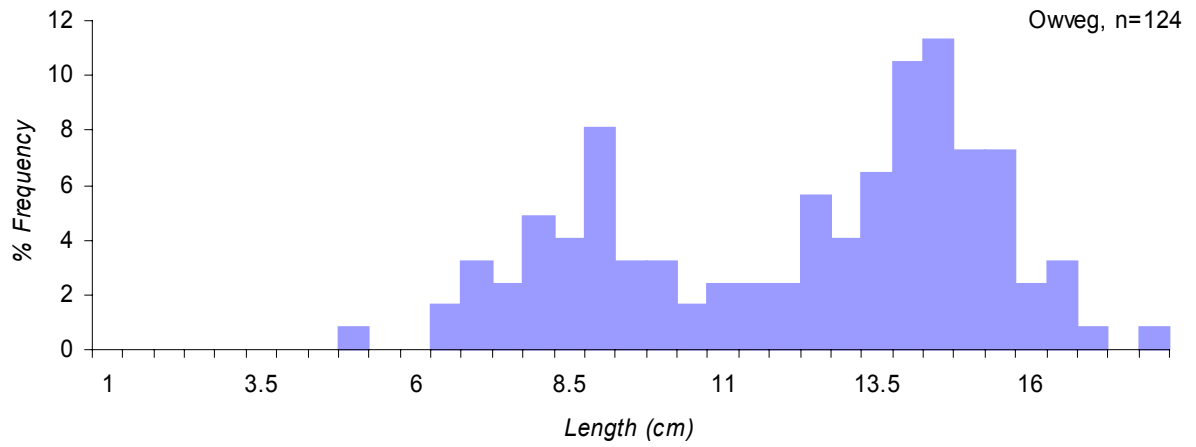


Figure 7 Length percentage frequency distributions of juvenile brook / river lampreys recorded from Owveg River.







Plate 5 Lamprey catch from the lower Owveg River.









Plate 6 *Lampetra* sp. transformer from the River Owveg.

4.4 Lamprey habitats in the River Feale catchment

In the Feale catchment in general there is a paucity of suitable lamprey nursery habitats. The main reason for this is the predominance of high gradient channels in the catchment which are subject to erosive spates. Arterial drainage works may also have removed habitats from other areas, i.e. Galey catchment. Most of the areas fished during the current survey were considered to be sub-optimum habitats. A few areas which were considered to have near optimum lamprey nursery habitat were assessed. These were generally located in areas where backwater habitats developed due to channel braiding or meandering, active channel erosion, or at artificial structures such as bridges and fords. The highest densities of lampreys were found in these areas. However, lampreys were also recorded at low densities on variety of sub-optimal habitats on the Feale downstream of the Owveg confluence, and on the lower reaches of tributaries such as the Oolagh and Owveg. Overall lamprey production from these sub-optimal habitats may be significant.

Site	Location	Photograph	Characteristics
F11	Duagh Bridge on the lower Feale.		This area of habitat was located at a small depositing area on a side channel off the main Feale downstream of Duagh Bridge. The nursery area had no flow and had 40% cover of rooted vegetation. Substrate was dominated by fine silt. This site had the highest density of lampreys in the current survey.
F4	Downstream of Listowel		This habitat area was also located depositing backwater alcove on a side channel upstream of a footbridge. Good rooted vegetation cover and a substrate dominated by fine sand/silt provided an optimum habitat for juvenile lampreys.
OL1	Oolagh 100m downstream of Port br.		A depositing area had formed on the meander of the river and a number of large trees had lodged allowing a large deposit of silt to form. This area was also shaded by the bank and had significant rooted vegetation cover.
OW1	Owveg upstream of Bateman's Bridge		This was an extensive backwater depositing area which had formed at an eroding bend of the river. Significant quantities of alluvial silt were present along with a large quantity of woody debris. Rooted vegetation was also present. This was the only site where lampreys were found on this river.

<p>Q2</p>	<p>Upstream of ford in middle reaches of Oolagh</p>		<p>This was another alcove type habitat which had formed upstream of a ford and downstream of a pillar of a bridge. The substrate was dominated by soft silt.</p>
<p>F3</p>	<p>Lower Feale at Scartleigh (upstream of Finuge Weir)</p>		<p>The reduced flow behind Finuge weir has allowed physically suitable habitats to form at this site. The weir reduces the impact of flood events on this area and woody debris has accumulated. Substrate was dominated by fine clay with some silt and sand.</p>
<p>F6</p>	<p>Upstream of Listowel Bridge</p>		<p>Water in this area is held back by the underpinning at Listowel bridge and the channel thalweg is near the left river bank. This has allowed fairly optimum habitats for lampreys to develop on the right bank with silt and woody material deposited along this side.</p>
<p>F2</p>	<p>Finuge Bridge</p>		<p>Upstream of Finuge Bridge there are a number of rock outcrops. Backwater habitats for lampreys have developed behind these rocks.</p>
<p>F10</p>	<p>Feale at Shanacool</p>		<p>This habitat is located along the bank of a large pool. The reduced flow along the right bank has allowed silt beds to develop and shading is provided by overhanging trees. Lampreys were living within the roots of aquatic macrophytes.</p>
<p>F14</p>	<p>Middle reaches of the Feale at Wellesley bridge</p>		<p>A backwater habitat has developed under this bridge resulting in the accumulation of large quantities of silt and some large woody debris. The bridge also provides shading.</p>

4.5 Quantitative electrical fishing assessments

Quantitative assessments were undertaken at three sites during the current assessment (Feale at Duagh, Lower Owveg, and Lower Oolagh). The locations of these sites are also provided in Figure 1 and Appendix 1. The results of these assessments are provided in Figure 8 and Table 6. During the quantitative electrical fishing assessments an overall 81.6% of the lampreys present in the four sites were captured during the first fishing. This is considered to be a very high efficiency.

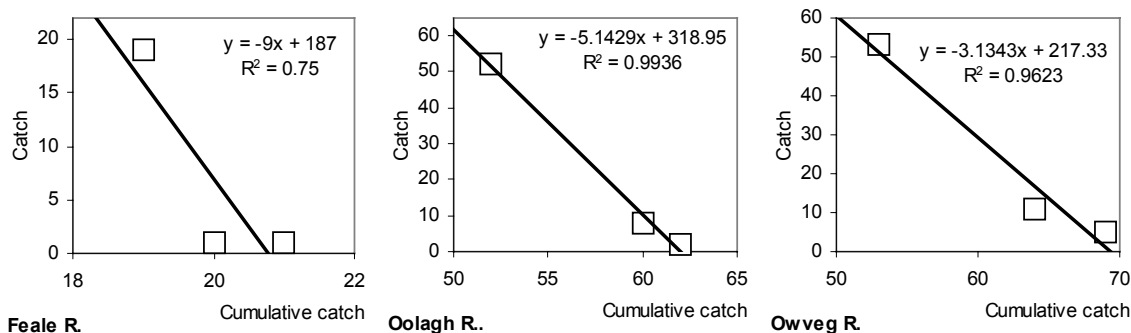


Figure 8 Results of the quantitative electrical fishing investigations at three sites. Catch is plotted against cumulative catch (Leslie-Davies method). Depletion lines for the total numbers of juvenile lamprey captured are given for the four sites.

Table 6 Density estimations (fish m⁻²) for lampreys at the three quantitative sites.

Site	Equation	R ²	Population estimate	Area (m ²)	Density (lamprey m ⁻²)
Q1	y = -9x + 187	0.75	21	5	4.20
Q2	y = -5.1429x + 318.95	0.99	62	7.4	8.38
Q3	y = -3.1343x + 217.33	0.96	69	7	9.86

4.6 Conservation status of lampreys in the Feale catchment

Table 6 provides an assessment of the favourable conservation status of river/brook lampreys in the Feale catchment. Based on the methodology of Harvey & Cowx (2003), river/brook lampreys are present at an unfavorable status in the Feale catchment. However, it is likely that the assessment criteria used may not be suitable for classifying spate rivers such as the Feale. The overall production of lampreys in the lower part of the catchment is likely to be significant. Table 7 provides an assessment of the favourable conservation status of sea lampreys in the Feale catchment.

Table 7 Assessment of Favourable Conservation Status of brook/river lampreys (*Lampetra* sp.) in the Feale catchment (based on Harvey & Cowx, 2003).

River	Abundance on optimal habitats	Abundance on a sub-catchment basis	Population structure	Distribution	Evaluation
<i>Lower Feale</i>	Unfavourable	Favourable	Several cohorts present	Widely distributed on optimal and sub-optimal habitats	Favourable
<i>Middle Feale</i>	Unfavourable	Unfavourable	Several cohorts present	Restricted distribution	Unfavourable
<i>Upper Feale</i>	No lampreys present	No lampreys present	No lampreys present	No lampreys present	Unfavourable
<i>Galey</i>	No lampreys present	No lampreys present	No lampreys present	No lampreys present	Unfavourable
<i>Smerlagh</i>	Unfavourable	Unfavourable	Could not be assessed	Restricted distribution	Unfavourable
<i>Oolagh</i>	Unfavourable	Unfavourable	Several cohorts present	Restricted distribution	Unfavourable
<i>Owveg</i>	Unfavourable	Unfavourable	Several cohorts present	Restricted distribution	Unfavourable
<i>Allaghan, Clydagh, Breanagh Caher and minor tributaries</i>	No lampreys present	No lampreys present	No lampreys present	No lampreys present	Unfavourable
Overall evaluation	Unfavourable	Unfavourable	Unfavourable	Unfavourable	Unfavourable*

*Note that assessment criteria used may not be suitable for classifying spate rivers.

Table 9 Assessment of Favourable Conservation Status of sea lampreys in the Feale catchment (based on the methodology of Harvey & Cowx, 2003).

River	Abundance on optimal habitats	Abundance on a sub-catchment basis	Population structure	Distribution	Evaluation
<i>Lower Feale</i>	Unfavourable	Favourable	Several cohorts present	Widely distributed on optimal and sub-optimal habitats	Favourable
<i>Middle Feale</i>	Unfavourable	Unfavourable	Several cohorts present	Restricted	Unfavourable
<i>Upper Feale</i>	No lampreys present	No lampreys present	No lampreys present	No lampreys present	Unfavourable
<i>Galey</i>	No lampreys present	No lampreys present	No lampreys present	No lampreys present	Unfavourable
<i>Smerlagh</i>	No lampreys present	No lampreys present	No lampreys present	No lampreys present	Unfavourable
<i>Oolagh</i>	No lampreys present	No lampreys present	No lampreys present	No lampreys present	Unfavourable
<i>Owveg</i>	Unfavourable	Unfavourable	More than one cohort present	Unfavourable	Unfavourable
<i>Allaghan, Clydagh, Breanagh Caher and minor tributaries</i>	No lampreys present	No lampreys present	No lampreys present	No lampreys present	Unfavourable
Overall evaluation	Unfavourable	Unfavourable	Unfavourable	Unfavourable	Unfavourable*

*Note that assessment criteria used may not be suitable for classifying spate rivers.

5. CONCLUSIONS AND RECOMENDATIONS

- Juvenile lampreys have a restricted distribution in the Feale catchment and are present at lower densities than in other Irish Rivers surveyed by NPWS to date. The Feale is a high gradient spate catchment subject to significant floods. This favours the creation of habitats more suited to salmonids. Several areas of the catchment have been subjected to arterial drainage works and this may also have affected lamprey populations in the catchment (i.e. in the Galey).
- Most of the areas fished during the current survey were considered to be sub-optimum habitats. However, a few areas which were considered to have near optimum lamprey nursery habitat were also assessed. These were generally located in areas where backwater habitats developed due to channel braiding or meandering, active channel erosion, or at artificial structures such as bridges and fords. The highest densities of lampreys were found in these areas.
- Based on the methodology proposed by English Nature, lampreys are present at an unfavourable status in the Feale catchment. However, it is likely that the assessment criteria used may not be suitable for classifying spate rivers such as the Feale. Although the densities recorded were generally low, the overall production of lampreys in the lower part of the catchment is likely to be significant.
- A significant number of the transformers recorded broadly corresponded to the description of river lamprey transformers given in the English Nature key and it is tentatively concluded that at least some of these specimens were *Lampetra fluviatilis*. However, it was not possible to distinguish the two species of *Lampetra* unambiguously in the field. The surveying of selected index sites later in the year (i.e. early winter) should also be considered. Lampreys at this time would be in later stages of transformation and these would be easier to identify.
- It is concluded that the main lamprey populations in the Feale catchment are currently protected within the existing SAC boundary area and no recommendations are made to extend the boundary area. The possibility of enhancing lamprey populations in the catchment through development works should be considered and provisions for lampreys should be included in any future development works undertaken by state agencies or local angling groups.

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APPENDIX 1 List of sites investigated during the 2005 survey of the Feale catchment.

Site Code	EPA code	Q-value 1998	River	Tributary	Location	Grid reference	Date surveyed	Lampreys present
F1	23/F/01/0860		Feale		Ballyhorgan West	Q92943 31249	23/08/2005	•
F2	23/F/01/0800	3	Feale		Finuge Br.	Q95151 32113	23/08/2005	•
F3	23/F/01/0750		Feale		Scartleigh, u/s of the weir	Q96266 32210	23/08/2005	•
F4	23/F/01/0725	3-4	Feale		Listowel Racecourse footbridge	Q98857 33470	23/08/2005	•
F5	23/F/01/0650		Feale		Listowel, u/s of Racecourse footbridge	Q98857 33470	28/08/2005	•
F6	23/F/01/0600	4	Feale		Listowel Br, N69	Q99554 33288	24/08/2005	•
F7	23/F/01/0590		Feale		300m u/s of Listowel Br.	Q99704 33318	28/08/2005	•
F8	23/F/01/0590		Feale		Ballinruddery	R01668 33641	24/08/2005	
F9	23/F/01/0590		Feale		Inchymagillagher (Smearlagh confluence)	R03007 32948	24/08/2005	•
F10	23/F/01/0550	4	Feale		Shanacool	R03201 33083	31/08/2005	•
F11	23/F/01/0500	4	Feale		d/s Duagh Br.	R07134 30594	31/08/2005	•
F12	23/F/01/0500	4	Feale		Duagh Br.	R07293 30512	31/08/2005	•
F13	23/F/01/0400		Feale		Ballymacjordan, 1.5km d/s of Abbeyfeale	R10608 27994	01/09/2005	
F14	23/F/01/0200	4-5	Feale		Wellesley Br.	R09626 23102	28/08/2005	•
F15	23/F/01/0120	4	Feale		Confluence with Clydagh	R13467 20298	28/08/2005	•
F16	23/F/01/0100		Feale		Mountcollins Br.	R15720 18693	29/08/2005	
F17	23/F/01/0050		Feale		Acres Br.	R17023 16909	29/08/2005	
F18	23/F/01/0040	3-4	Feale		Glenacarney Br.	R19111 15033	29/08/2005	
F19	23/F/01/0030		Feale		Glenacarney, 1.4km u/s Br.	R20362 14823	30/08/2005	
F20	23/F/01/0020	4	Feale		Rockchapel	R21709 15732	30/08/2005	
F21			Feale	Lyraneag	Rockchapel	R22119 15875	30/08/2005	
G1	23/G/01/0700	3	Galey		Drommurrin Br.	Q90482 34123	23/08/2005	
G2	23/G/01/0600		Galey		Inch Br.	Q95797 36319	23/08/2005	
G3	23/G/01/0500	3-4	Galey		Shrone Br.	Q97866 37200	28/08/2005	
G4	23/T/03/0050	3	Galey	Tarmon Stream	Gabbet's Br.	R01849 40153	29/08/2005	
G5			Galey	Pound River	Leitrim Br.	R05362 40708	30/08/2005	
G6	23/G/01/0400	3-4	Galey		Galey Br. N69	R04408 38377	28/08/2005	
G7	23/G/01/0300	3-4	Galey		Ahavoher Br.	R06875 37073	29/08/2005	
G8	23/K/02/0100	4	Galey		R524 Br.	R12459 36507	29/08/2005	
G9	23/G/01/0100	4	Galey		Athea, R523 Br.	R12601 35079	29/08/2005	
S1	23/S/02/0700	4	Smearlagh		Kennelly's Br.	R02501 32356	24/08/2005	•
S2	23/S/02/0700	4	Smearlagh		Knight's Br. R555	R01921 31839	01/09/2005	•
S3	23/S/02/0500	4	Smearlagh		Gortacloghane	R01385 26554	01/09/2005	
S4	23/S/02/0400	4-5	Smearlagh		Lyracrumpane	Q98362 23241	01/09/2005	
OL1	23/O/01/0500	4	Oolagh		Port	R11331 28232	29/09/2005	•
OL2	23/O/01/0500	4	Oolagh		Oolagh Br. R524	R13446 30377	19/09/2005	
OL3	23/O/01/0500	4	Oolagh		Cratloe, Br. u/p Oolagh Br.	R15061 30907	19/09/2005	
OL4			Oolagh	Knocknasna Stream	Cratloe West	R13088 31267	19/09/2005	

APPENDIX 1 (Continued) List of sites investigated during the 2005 survey of the Feale catchment.

Site Code	EPA code	Q-value 1998	River	Tributary	Location	Grid reference	Date surveyed	Lampreys present
A2	23/A/01/0700	4	Allaghaun		Allaghaun Br.	R13672 27274	01/09/2005	
A3	23/A/01/0500		Allaghaun		Glengort North	R18365 24952	15/09/2005	
A4	23/A/01/0400	4	Allaghaun		Tour Br.	R22140 24708	15/09/2005	
A5			Allaghaun		Toornafulla	R22623 22013	15/09/2005	
A6	23/A/01/0900	4	Allaghaun	Iskule Stream	Glenquin South	R24598 24007	15/09/2005	
Ow1	23/O/03/0500	4	Owveg		Bateman's Br.	R08622 23263	15/09/2005	•
Ow2	23/O/03/0400		Owveg		Br. d/s of Glena confluence	R07827 22091	16/09/2005	
Ow3			Owveg	Glena River	Ford Br.	R07575 22065	15/09/2005	
Ow4	23/O/03/0400		Owveg		350m u/s of Glena confluence	R07586 21720	26/09/2005	
Ow5	23/O/03/0350	4	Owveg		Knocknagashel East	R07120 20510	16/09/2005	
Ow6	23/O/03/0200	4	Owveg		Heailley Br.	R07192 19470	16/09/2005	
C1	23/C/01/0500	4	Clydagh		Clydagh Br.	R13700 20004	30/08/2005	
C2	23/C/01/0400		Clydagh		Brosna Br.	R13204 18603	30/08/2005	
C3	23/C/01/0300		Clydagh		Br. SE of Knoppoge	R12607 16808	30/08/2005	
Ca1	23/C/01/0200		Caher		Mountcollins Br.	R16067 19016	31/08/2005	
B1	23/B/01/0300	4	Breanagh		Breanagh Br.	R17288 15484	31/08/2005	
B2	23/B/01/0200		Breanagh		Cloghvoula Br.	R16791 13252	31/08/2005	
Q1	23/F/01/0500	4			d/s Duagh Br.	R07134 30594	31/08/2005	•
Q2	23/O/01/0500	4	Oolagh		Ford	R12095 28955	16/09/2005	•
Q3	23/O/03/0500	4	Owveg		Bateman's Br.	R08622 23263	16/09/2005	•