LOUGHS AGENCY OF THE FOYLE CARLINGFORD AND IRISH LIGHTS COMMISSION

Lamprey Baseline Survey No3: River Foyle and Tributaries SAC

Juvenile lamprey population assessment

Loughs Agency of the Foyle Carlingford and Irish Lights Commission

Art Niven & Mark McCauley, December 2013

This baseline survey was conducted to record the abundance and distribution of juvenile lamprey within the River Foyle & Tributaries during the summer and autumn of 2012.

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Report Reference LA/Lamprey/05-18/13 (No. 3 in a series)

CITATION: Niven, A.J. & McCauley, M. (2013) Lamprey Baseline Survey No3: River Foyle and Tributaries SAC. Loughs Agency, 22, Victoria Road, Derry~Londonderry

DOCUMENT CONTROL

Name of Document	Lamprey Baseline Survey No3: River Foyle and Tributaries SAC				
Author (s):	Art Niven and Mark McCauley				
Authorised Officer:					
Description of Content:	River Foyle and Tributaries: Juvenile Lamprey Population Assessment 2012				
Approved by:	John McCartney				
Date of Approval:	December 2013				
Assigned review period:					
Date of next review:					
Document Code	LA/Lamprey/05-18/13				
This documents comprises	**TOC**	**Text**	**List of tables**	**Table of Figures**	**No. Appendices**
	X	X	X	X	

Version Control Table

Version No.	Status	Author (s)	Reviewed by	Approved by	Date of issue
Version 1	Draft	Art Niven	John McCartney	John Pollock	31/12/2013
Revision 2					
Revision 3					
Version 3					
Version 4					

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ACKNOWLEDGEMENTS

The Loughs Agency sponsoring departments, board and staff are gratefully acknowledged for the funding, support and assistance provided to conduct baseline lamprey population monitoring in the Foyle and Carlingford areas.

Land owners and angling associations are also gratefully acknowledged for their co-operation.

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EXECUTIVE SUMMARY

This report is number three in a series of baseline juvenile lamprey population assessments. Baseline surveys were conducted to record the abundance and distribution of juvenile lamprey within the River Foyle and Tributaries SAC during the summer and autumn of 2012. The catchment is located in the Loughs Agency Foyle area lying wholly within County Tyrone, Northern Ireland. The surveys utilised a methodology followed by Inland Fisheries Ireland (IFI) and outlined in the Conserving Natura 2000 Rivers Monitoring Series No. 5.(Monitoring the River, Brook and Sea Lamprey). Training was provided by IFI prior to the commencement of the baseline catchment wide surveys in 2010. Annual refresher training is conducted by the Loughs Agency.

Three lamprey species occur in the Foyle area, Sea lamprey, *Petromyzon marinus* (L.), River lamprey *Lampetra fluviatilis* (L.), and Brook lamprey, *Lampetra planeri* (Bloch). Unidentified juvenile lampreys have been recorded in the Carlingford area. Monitoring and reporting of lamprey conservation status in the context of the EU Habitats Directive (Directive 92/43/EEC) is discussed and future survey proposals outlined for both Special Areas of Conservation (SAC) and non SAC catchments within the Foyle and Carlingford areas. The report highlights the importance of monitoring, conserving and protecting lamprey populations in the context of wider biodiversity conservation and education to ensure sustainable management of these unique parts of Ireland's native fishery biodiversity.

Previous records of lamprey presence within the Foyle and Carlingford areas are displayed and past and future recording systems discussed. In parallel to King (2006) sampling in the main stem of the River Foyle was hampered by excessive depth for the sampling technique used. Threats to the long term conservation of lamprey populations are highlighted and discussed with particular reference to the Foyle and Carlingford areas. Recommendations for further research into the lamprey populations of the Foyle and Carlingford areas are made.

1.0 INTRODUCTION

Lampreys are members of a primitive group of fish called the Agnatha or jawless fish. The first Agnathans can be dated back to the Ordovician period about 500 million years ago. Lampreys in addition to having no jaws, lack scales or paired fins (Kurz and Costello, 1999). Adult River and Sea lampreys have a toothed oral disc which they use to attach to prey where they parasitically feed on the hosts body fluids. Brook lampreys remain in freshwater for their entire life and are non parasitic. Lampreys have seven gill openings on each side of their body with distinct eyes forming prior to adulthood. As mature adults the three species native to Ireland can easily be distinguished by their size, colour, shape of dorsal fins and the arrangement of their teeth (Kurz and Costello, 1999).

Sea and River lampreys are anadromous migrating between the freshwater and marine environments, returning to freshwater to breed in gravel shallows. Man made barriers to migration in rivers such as weirs and dams have reduced the available area of aquatic habitat accessible to both these species. Spawning nests called redds are built by all lamprey species. The larger Sea lamprey prefer cobbles and pebbles for spawning, where they spawn in pairs or small groups, River lamprey prefer sandy or gravelly sediment where they also spawn in pairs. Brook lamprey spawn in smaller slower flowing tributaries preferring spawning substrate similar to that used by the River lamprey where they spawn in groups of ten and over. All adult lampreys die after spawning.

The three species of lamprey present in Ireland have complex life histories which vary depending on the species and location. All three species also have many common biological and ecological traits. Similarities include a common juvenile stage where after hatching from the redd, the larvae called ammocoetes create burrows in river detritus and fine sediments in back eddies or other areas of slack water. After spending a number of years (dependant on species) feeding on organic material metamorphosis occurs with the ammocoetes transforming into macropthalmia often referred to as transformers where a visible eye is now present. It is at this stage when the river and sea lamprey migrate to sea to begin their parasitic phase feeding on a variety of fish hosts.

Ammocoetes of all three species look very similar and can be found in the same areas although Brook lamprey juveniles tend to be more dispersed throughout catchments as they do not have to ascend obstacles on a return migration from the sea. Differentiation between species at this juvenile/ammocoete stage is difficult with field based identification often being limited to identifying only between River/Brook and Sea lamprey.

The diagram below outlines the life cycle of anadromous lampreys (River and Sea Lamprey).

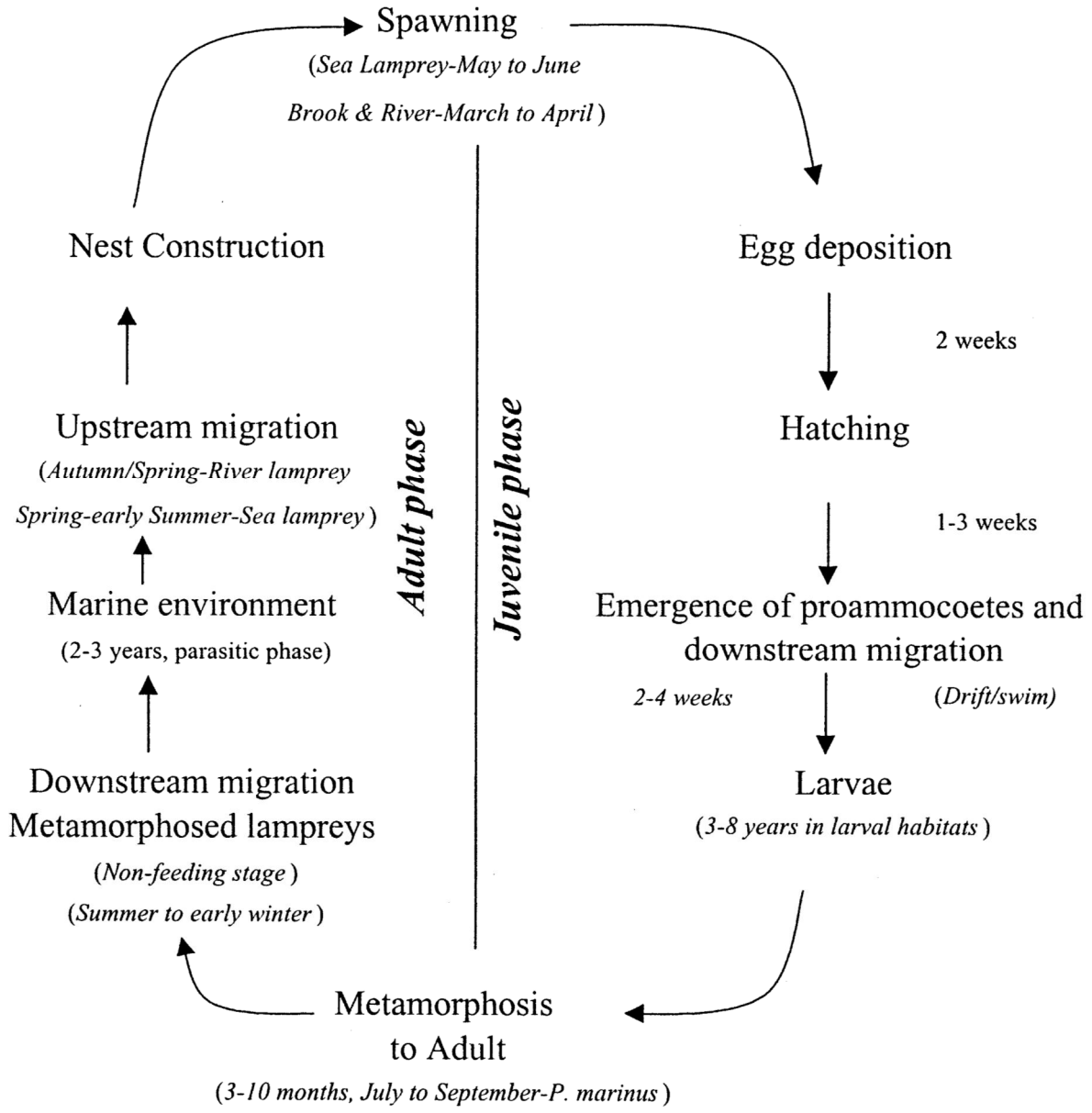

Fig.1 Life cycle of anadromous lampreys (Kelly & King 2001)

These lamprey species are known to occur in the Foyle area while unidentified species of lamprey are present in the Carlingford area.

All three lamprey species are also designated under Annex II of the European Union Habitats Directive (Directive 92/43/EEC) requiring member states to designate Special Areas of Conservation (SACs) for their protection. In the Foyle area there are five large river SACs designated under the Habitats Directive. The River Foyle and Tributaries, the River Roe and Tributaries, the River Faughan and Tributaries, the Owenkillew River and the River Finn and Tributaries. Under the Habitats Directive site condition monitoring against favourable conditions for lamprey species should be made on a six yearly rolling basis. The next date for reporting on condition monitoring is 2019.

The reason for designating and managing SAC's is to maintain at, or restore to, "favourable conservation status" the habitats and species listed on annexes I and II of the directive (Harvey & Cowx, 2003).

Existing records did not provide enough information on the species specific abundance and distribution required for site condition monitoring. A need was identified to implement a specific methodology for assessing condition as required under the Habitats Directive within the Foyle and Carlingford areas. The methodologies adopted during this survey followed those developed by IFI incorporating recommendations made in the LIFE in UK Rivers, Conserving Natura 2000 Rivers, Monitoring Series No 5. Monitoring the River, Brook and Sea Lamprey (Harvey & Cowx, 2003).

2.0 METHODS

The surveys took place from September to October 2012 and focused on recording the abundance and distribution of juvenile lamprey. Sampling was conducted using electrofishing techniques following standard procedures to ensure future comparison of data highlighting population trends between rivers and years. Quantitative electrofishing of optimal habitat using $1m^2$ quadrats supported by semi-quantitative sampling of sub-optimal habitat is

recommended for assessment of juvenile lamprey in SAC Rivers. Site selection was based on the location of existing Northern Ireland Environment Agency (NIEA) water quality monitoring stations. Where possible, sites with appropriate areas of sediment, (optimal habitat) in low velocity areas and in wadable depth were chosen.

Fig.2 Juvenile lamprey sampling equipment, not including electrofishing pack

An area of approximately 200m upstream and 200m downstream from all sites were examined for appropriate optimal habitat. If no optimal habitat was located sub optimal habitat was surveyed. The methodologies employed for surveying lamprey ammocoetes varies from those used for juvenile salmonids and requires a dedicated survey. A number of complimentary sampling techniques were used during the survey. The first technique was a quantitative method using a 1m² fine mesh quadrat. The quadrat was electrofished for five, twenty second bursts, with five second intervals over the course of two minutes. Each cycle constituted one removal sampling pass. Multiple passes were conducted as part of the quantitative method. A semi-quantitative technique of single pass surveys over carefully defined areas of sub-optimal habitat was also used to augment the quantitative method. This also entailed five, twenty second bursts of electrofishing of the chosen site.

Fig.3 Example of optimal juvenile lamprey habitat

Fig.4 Quantitative survey methodology using 1m^2 quadrat in optimal habitat

Using pulsed DC a single anode was used within the quadrat avoiding contact with the substrate. Over a two minute period the anode was energised for 20 seconds and turned off for five seconds repeatedly. All fish captured during the first 2 minute period were placed in a separate bucket from future sampling periods. A 5 minute break was taken between 2 minute sampling periods. If captures during the second period represented a high fraction of the size of the first catch then it was deemed appropriate to do a third fishing. Approximately 50% depletion between sampling periods is required to facilitate density estimates. All electrofishing was conducted using a Smith Root Inc. LR24 backpack. Immobilised ammocoetes were removed using a fine mesh catching net and transferred to a bucket of water. All ammocoetes and transformers were identified as River/Brook Lamprey or Sea Lamprey, then weighed and measured. Single pass electrofishing in sub-optimal habitat was conducted using a semi quantitative methodology over a clearly defined area of riverbed.

The area sampled was measured accurately so that a minimum density estimate could be derived. No enclosure was used and all lampreys were collected and measured.

Fig.5 Semi quantitative sampling of sub-optimal habitat on the River Derg, 2012

Minimum density estimates based on area fished and density estimates based on removal sampling results were calculated for each site at which lampreys were present and are outlined in the results section. Push net sampling and spot electrofishing were also conducted as an exploratory tool to ascertain if it was worthwhile conducting electrofishing operations at sites with sub optimal habitat. The contents of a micro mesh kick net were emptied onto a small tarpaulin for close examination of lamprey ammocoetes. If ammocoetes were present either a quantitative survey or a semi quantitative survey were conducted depending on the area of available habitat.

Fig.6 Young of the year River/Brook lamprey ammocoete from the River Derg, 2012

Fig.7 River/Brook lamprey ammocoete from the Millbrook Burn, 2012

Fig.8 River/Brook lamprey transformer from the Mourne Beg River, 2012

Fig.9 Sea lamprey transformer from the River Mourne, 2012

Figures 6-8 show River/Brook Lamprey caught during the current study highlighting the diversity of sizes encountered from small young of the year to larger age classes. At the ammocoete stage it is not possible to identify the difference between a River and a Brook lamprey. For identification purposes lamprey ammocoetes were recorded as either River/Brook or Sea. River/Brook lamprey ammocoetes have an oral hood that is clear of pigmentation on the lower side and the caudal fin is spade shaped with pigmentation not extending into the caudal fin, see Figure 8. Sea lamprey ammocoetes have pigmentation throughout the oral hood and have a pointed caudal fin with black pigmentation present through the caudal fin, see Figure 10. The different identifying marks, between lamprey ammocoetes and adult transformers are shown in Figure 15. There is a marked contrast in the shape and pigmentation of the caudal fin between River/Brook and Sea lamprey ammocoetes, Figure 16. Figure 9. Is a picture of a Sea lamprey transformer from the River Mourne.

Fig.10 Distinguishing features of a Sea lamprey from the River Mourne, 2012.
* Note the black pigment running out into sword shaped caudal fin

Fig.11 Sea lamprey Ammocoete from the River Mourne, 2012

Fig.12 Sea lamprey Transformer from the River Mourne, 2012

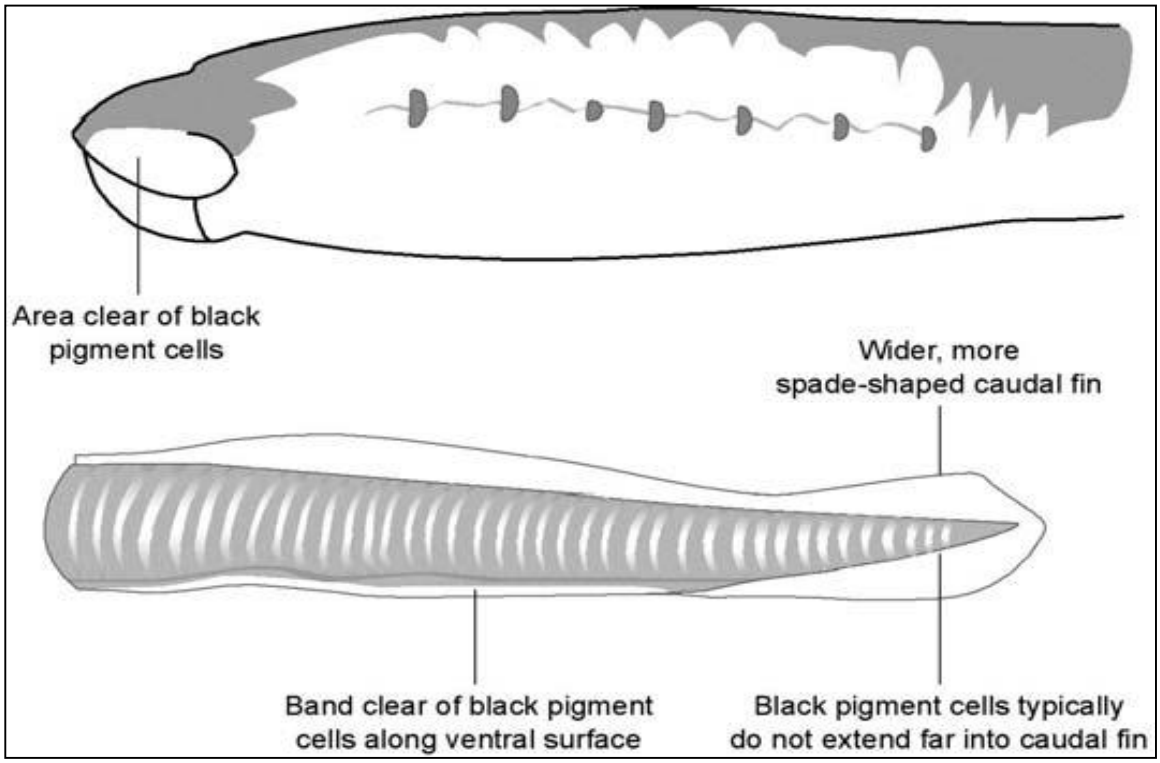

Fig.13 River/Brook lamprey ammocoete, features to aid identification, courtesy of Conserving NATURA 2000 Rivers

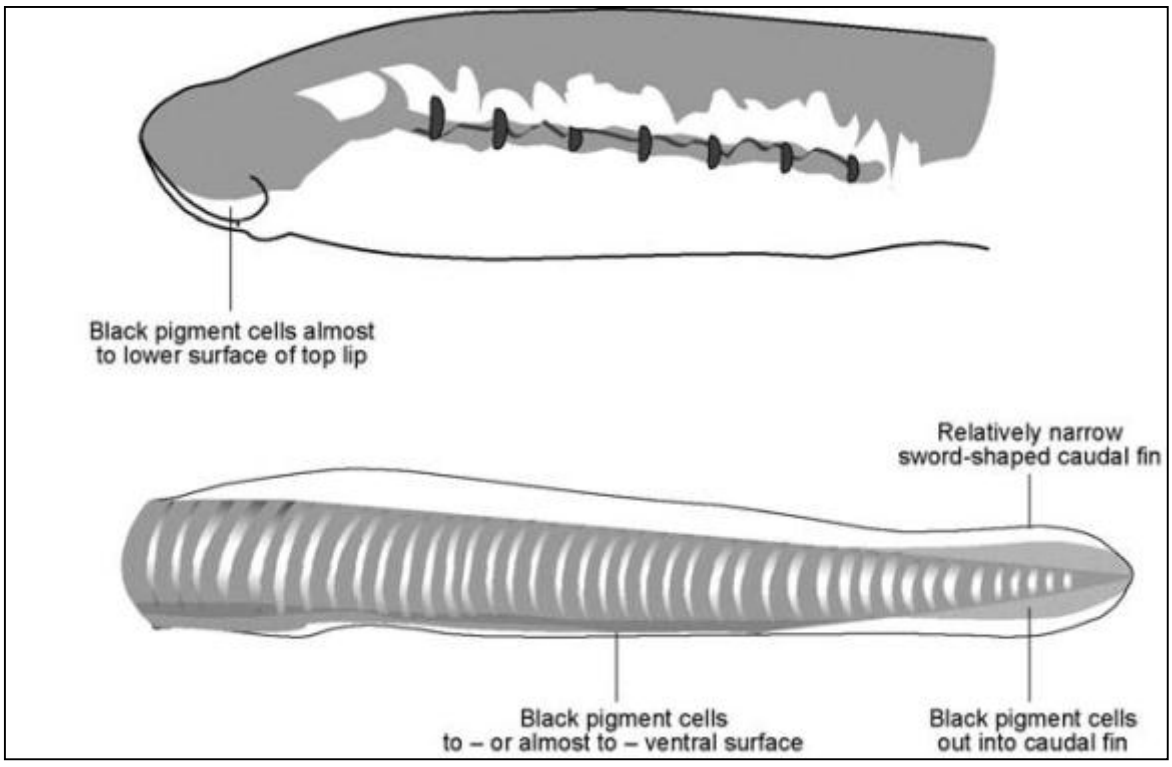

Fig.14 Sea lamprey ammocoete, features to aid identification, courtesy of Conserving NATURA 2000 Rivers

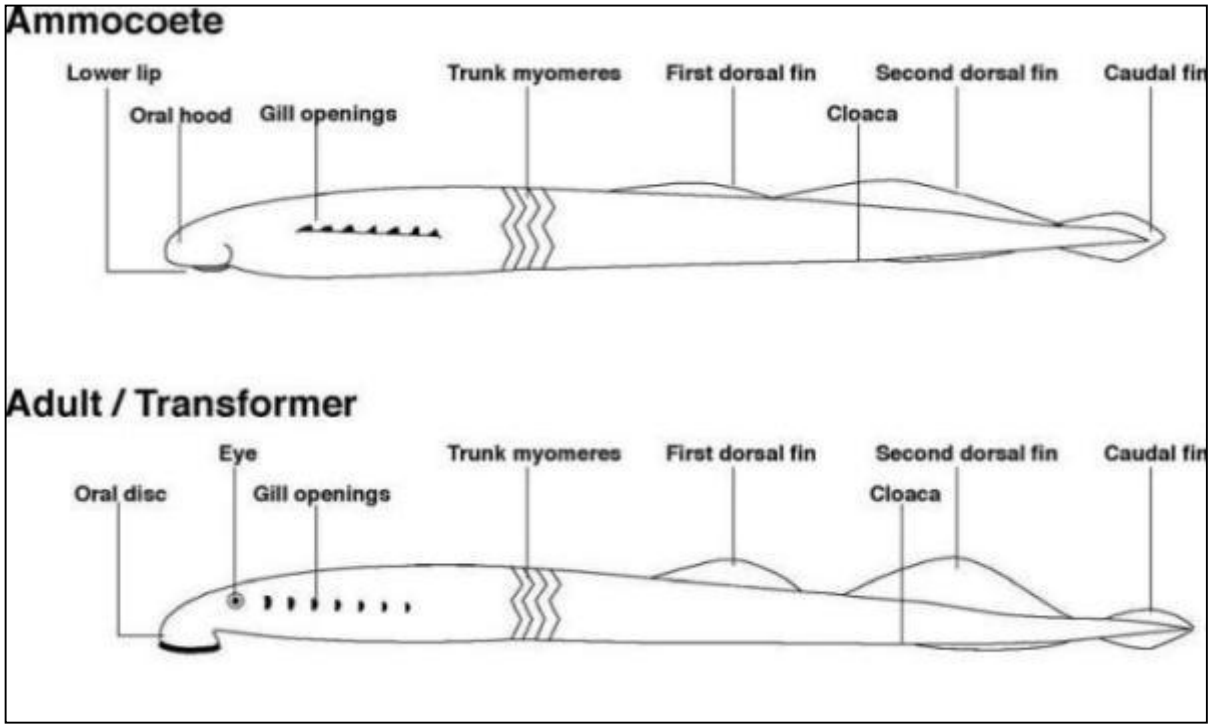

Fig.15 Lamprey ammocoete and adult/transformer, features to aid identification, courtesy of Conserving NATURA 2000 Rivers

Fig.16 Top Sea lamprey ammocoete and bottom River/Brook lamprey ammocoete. *Note differences in tail shape and pigmentation

All existing and historical records available for lamprey distribution within the Loughs Agency jurisdiction were collated as part of the current study forming a baseline of known lamprey distribution. These records were entered into the Loughs Agency Geographical Information System (GIS) for future reference and will be updated with results from future targeted lamprey surveys. The records are divided into six categories; Lamprey spp (unknown species), Brook lamprey, River/Brook lamprey, River lamprey and Sea lamprey. This data has been collated from a variety of sources reporting on other fisheries surveys where lamprey were caught or observed. This is in addition to the results generated from the current series of studies. A sample of Sea lamprey ammocoetes were taken back to the laboratory for closer inspection. All samples were confirmed as Sea lamprey ammocoetes after trunk myomere counts were conducted (Potter & Osborne, 1975).

Fig.17 Trunk myomeres on a River/Brook lamprey transformer on the River Derg, 2012

3.0 RESULTS

Prior to this series of surveys Loughs Agency records of lamprey distribution within the Foyle and Carlingford areas were stored in a variety of locations and were largely undifferentiated for species. As part of the current study all known records for the distribution and abundance of the three lamprey species by life history stage (if known) within the Foyle and Carlingford areas were collated into a spatial database within the Loughs Agency Geographical Information System (GIS). This information is presented below in Figs. 18 & 19.

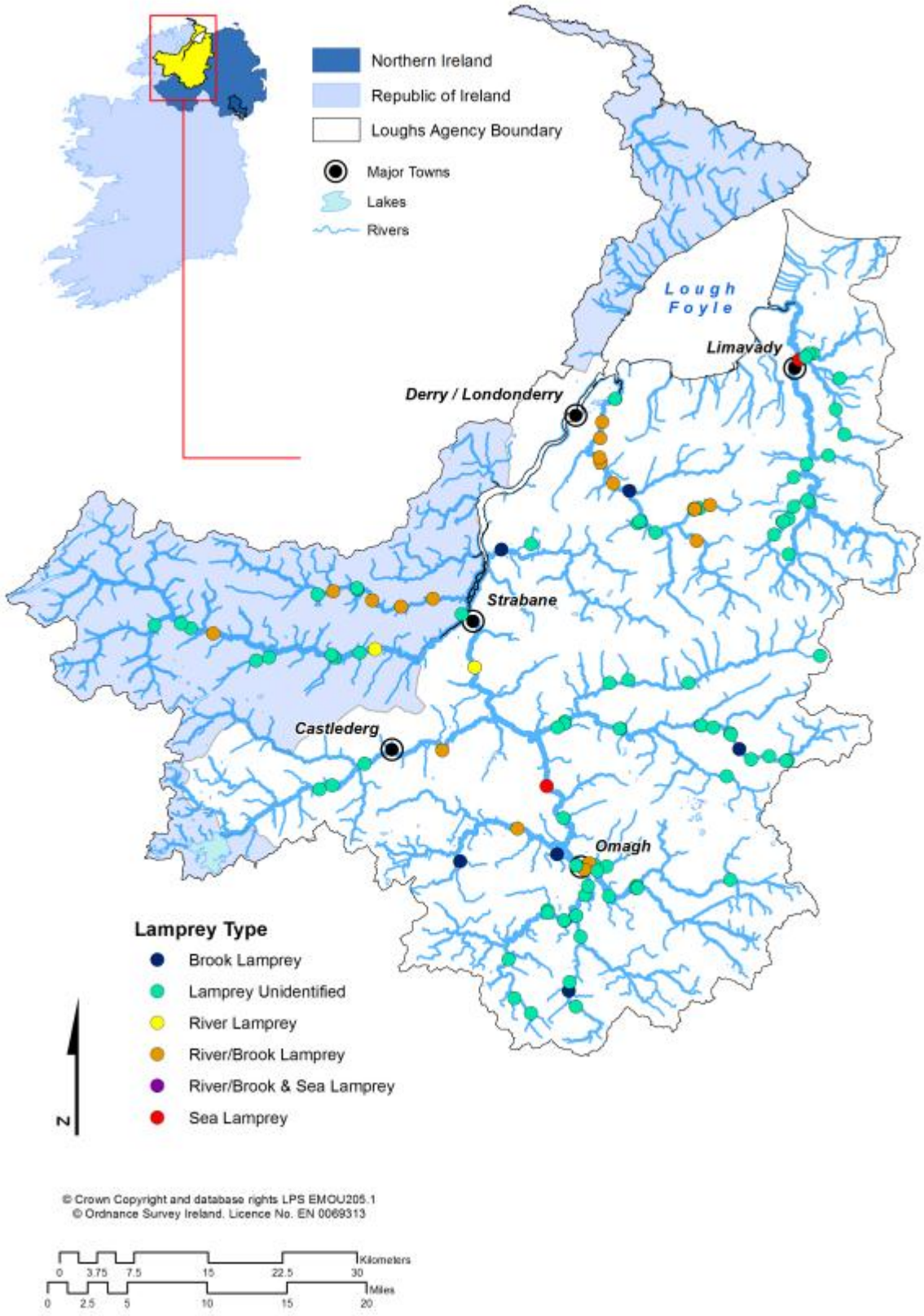

Fig.18 Known lamprey distribution within the Foyle area prior to current study. *Note some sites will have multiple records, only the top record is displayed. Summary information only.

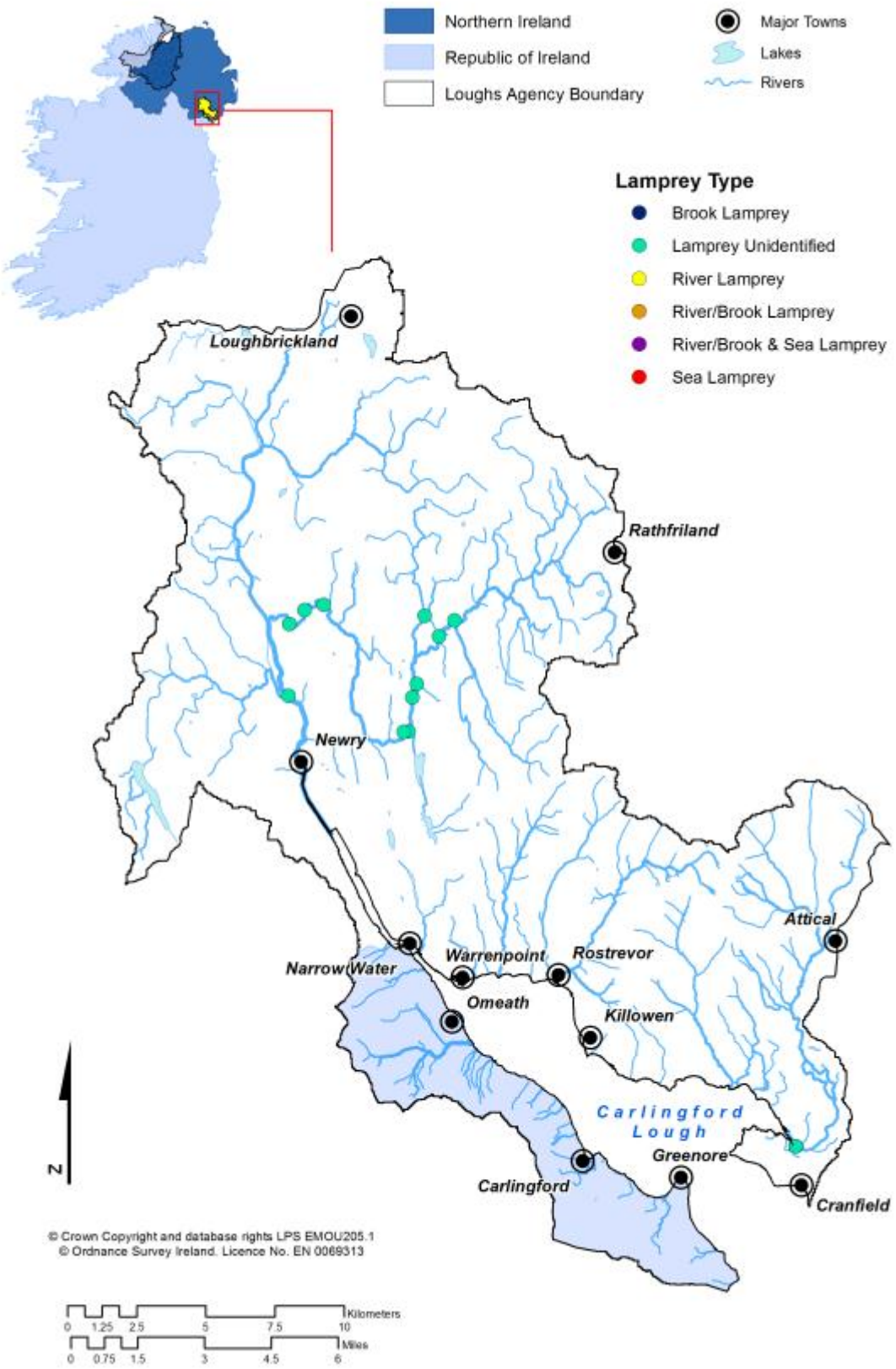

Fig.19 Known lamprey distribution within the Carlingford area

In 2012, twenty nine sites were surveyed within the Foyle and Tributaries SAC. River/Brook lamprey ammocoetes were recorded at sixteen sites in both optimal and sub-optimal habitat. Sea lamprey ammocoetes were recorded at four sites in optimal habitat only. Minimum density of *Lampetra* River/Brook ammocoetes ranged from 0 /m² to 34.38/m² with a mean minimum density of 8.72/m². Minimum density of *Lampetra* Sea lamprey ammocoetes ranged from 0 /m² to 6.28/m² with a mean minimum density of 0.5/m². *Lampetra* ammocoete populations at all sixteen positive sites within the Foyle and Tributaries SAC showed signs of recruitment (0+ individuals). Sea lamprey populations at all four positive sites within the Foyle and Tributaries SAC also showed signs of recruitment (0+ individuals). Transformers were caught at four sites within the Foyle and Tributaries SAC, with Sea lamprey transformers being found at one site on the River Mourne. In summary *Lampetra* ammocoetes were present at 55% of sites surveyed within the Foyle and Tributaries SAC with various age classes present at these sites. Sea lamprey ammocoetes were only found at four sites on the River Mourne, all downstream of a significant weir.

Fig.20 Weir at Sion Mills, on the River Mourne

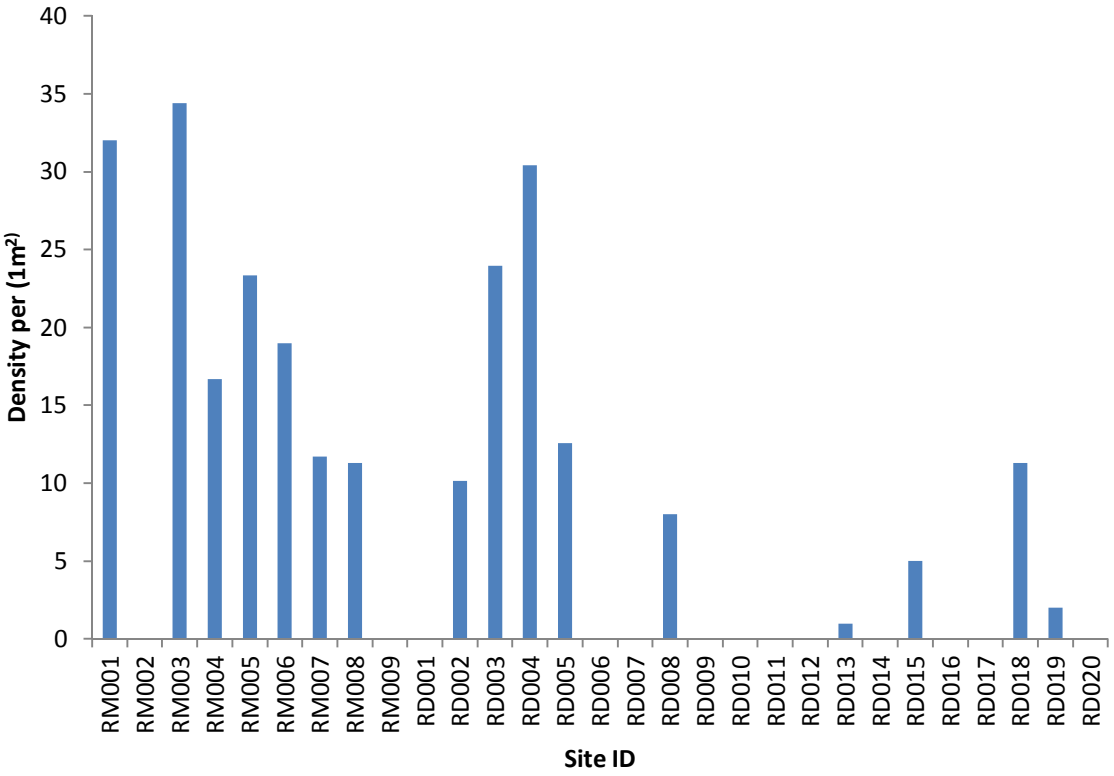

Fig.21 Density estimates of juvenile River/Brook Lamprey at all 29 sites surveyed within the Foyle and Tributaries SAC, 2012

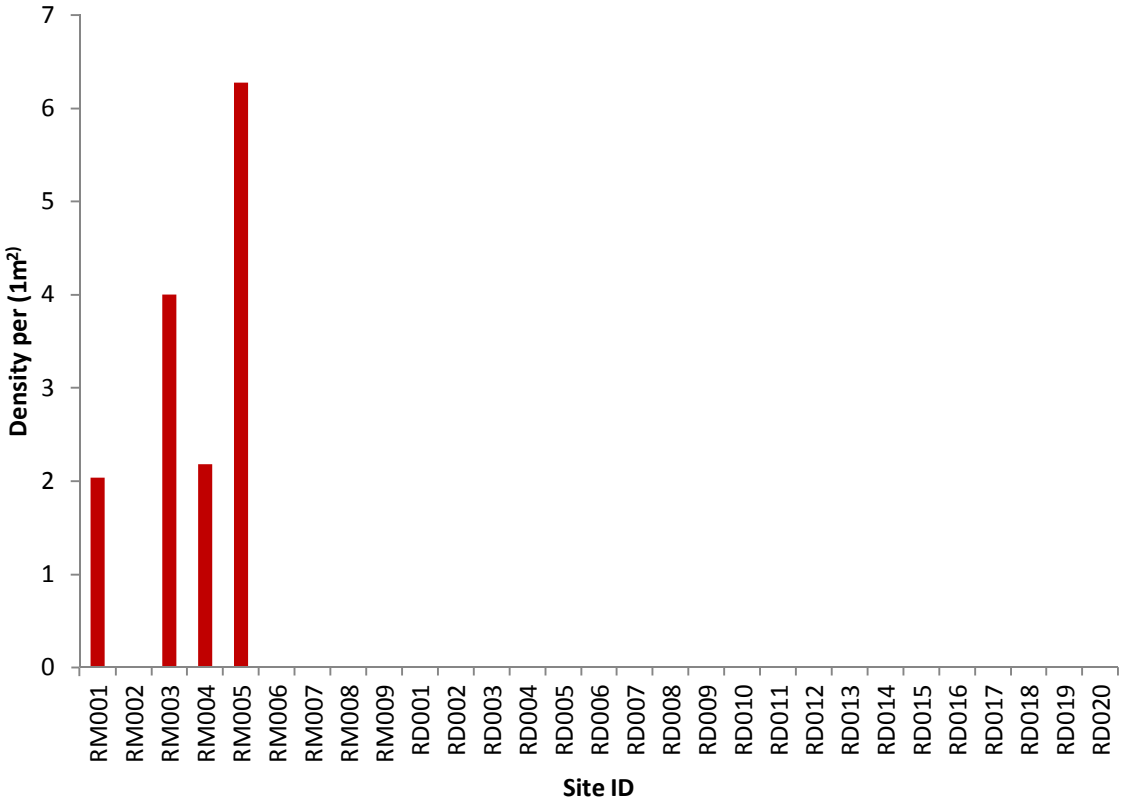

Fig.22 Density estimates of juvenile Sea Lamprey at all 29 sites surveyed within the Foyle and Tributaries SAC, 2012

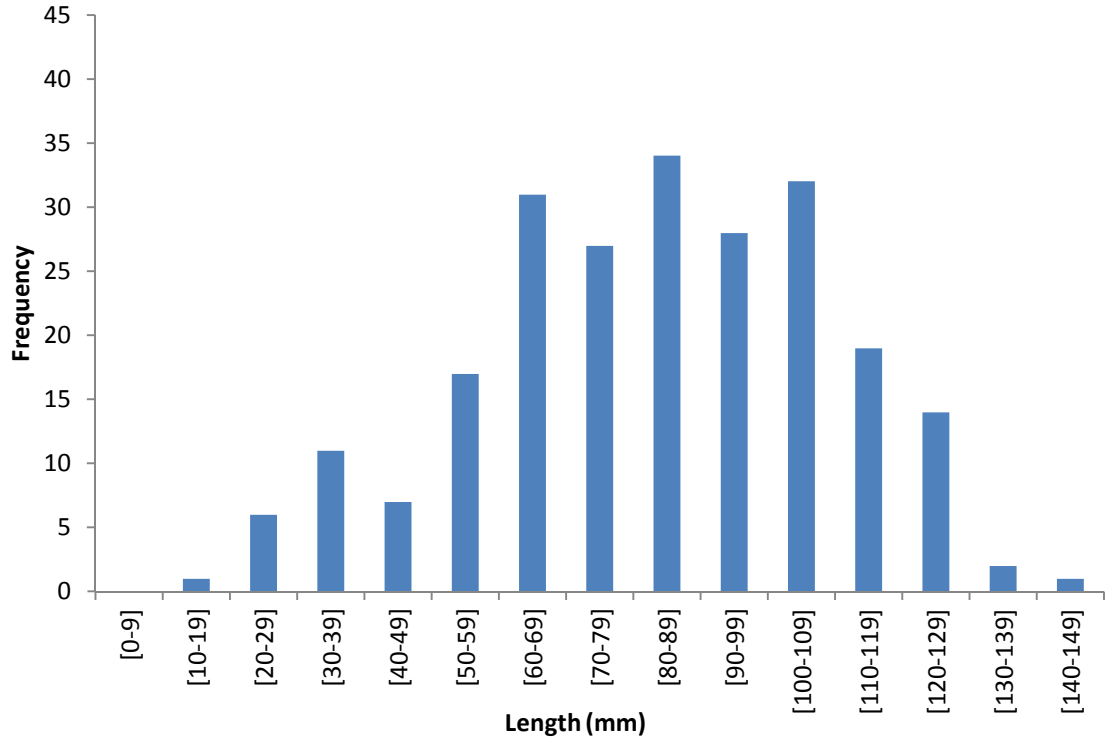

Fig.23 Length frequency distribution of juvenile River/Brook Lamprey at all 29 sites surveyed within the Foyle and Tributaries SAC, 2012 (N=230)

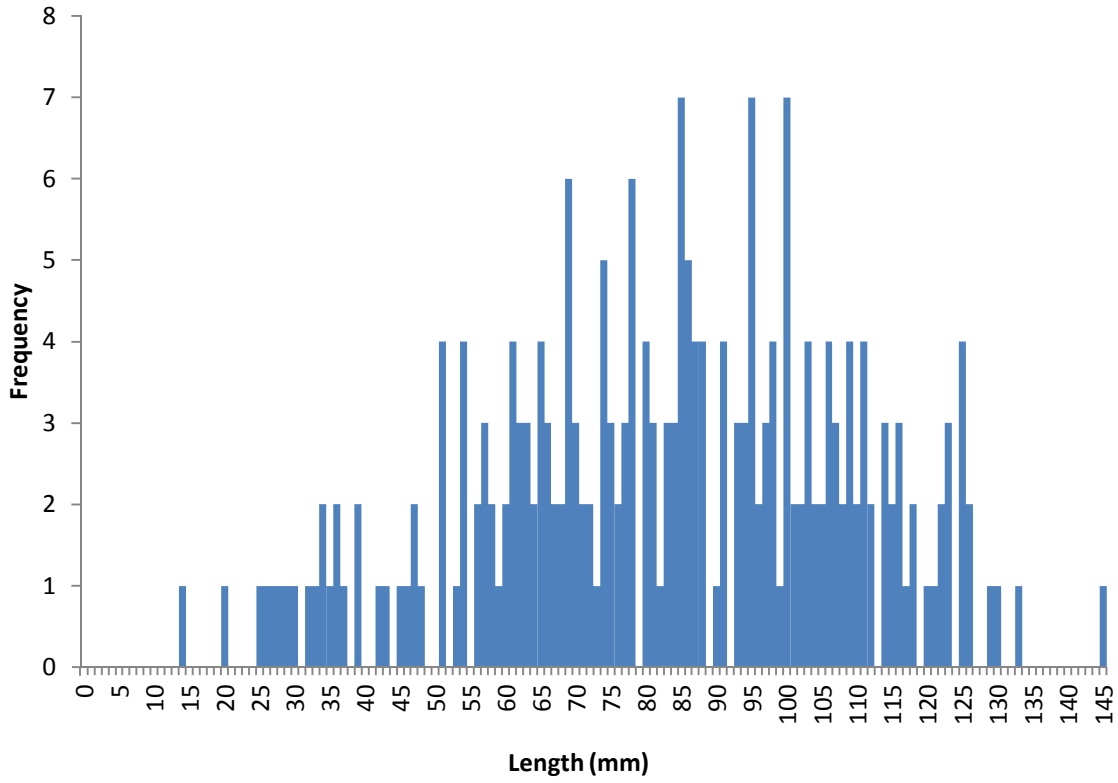

Fig.24 Length frequency distribution of juvenile River/Brook Lamprey at all 29 sites surveyed within the Foyle and Tributaries SAC, 2012 (N=230)

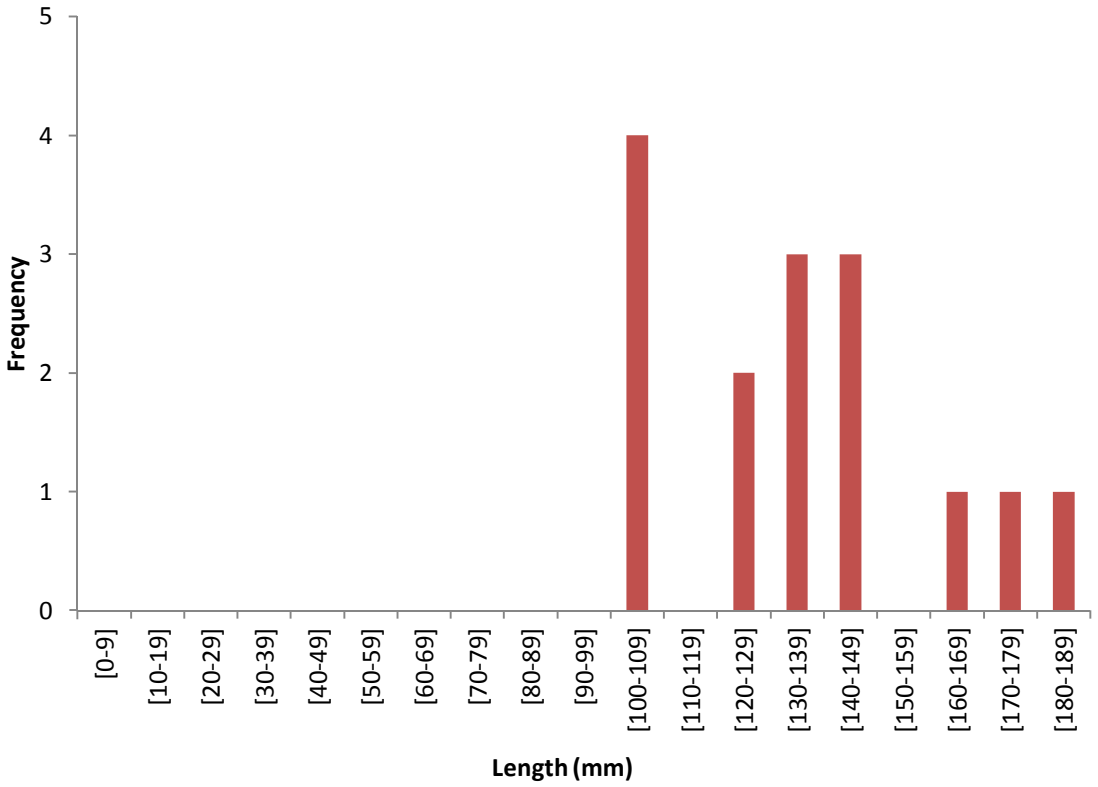

Fig.25 Length frequency distribution of juvenile Sea Lamprey at all 29 sites surveyed within the Foyle and Tributaries SAC, 2012 (N=15)

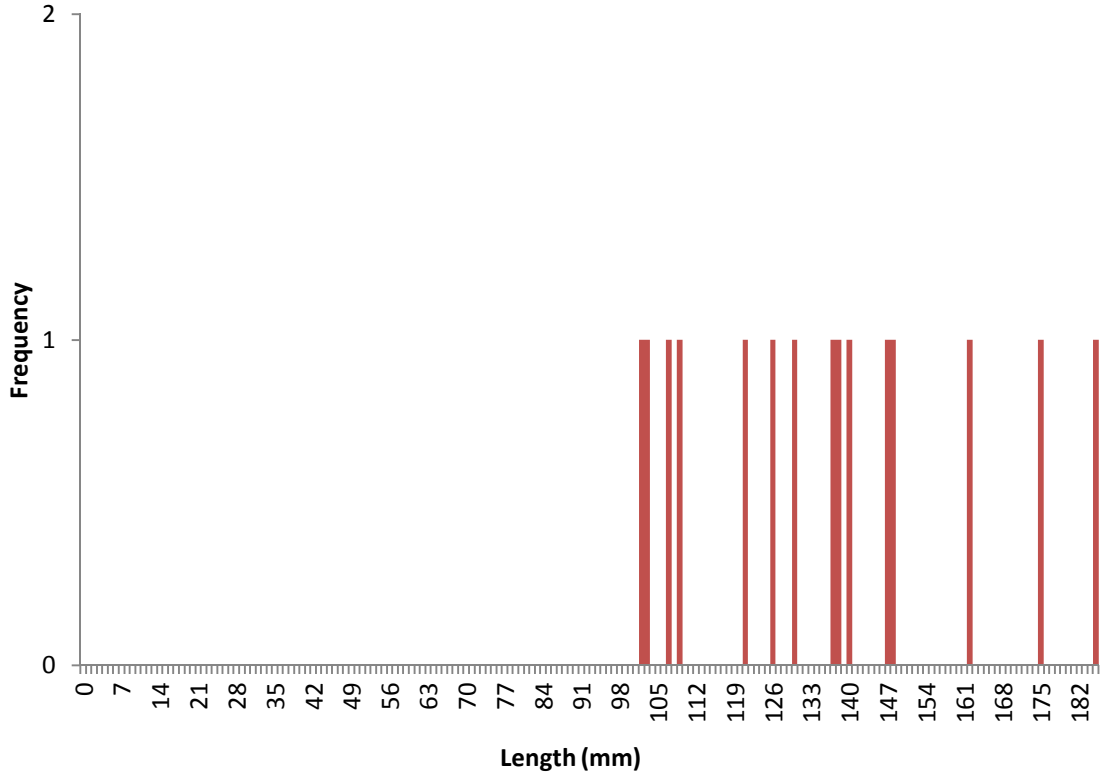

Fig.26 Length frequency distribution of juvenile Sea Lamprey at all 29 sites surveyed within the Foyle and Tributaries SAC, 2012 (N=15)

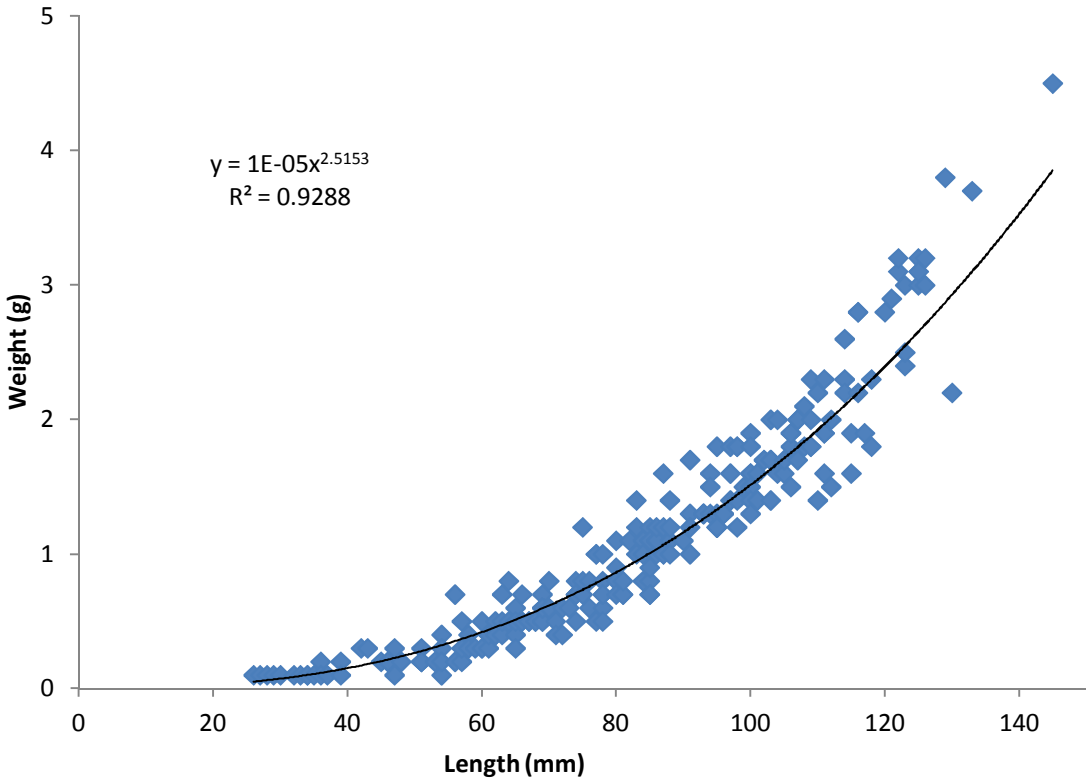

Fig.27 Length weight relationship of juvenile River/Brook Lamprey at all 29 sites surveyed within the Foyle and Tributaries SAC, 2012 (N=227)

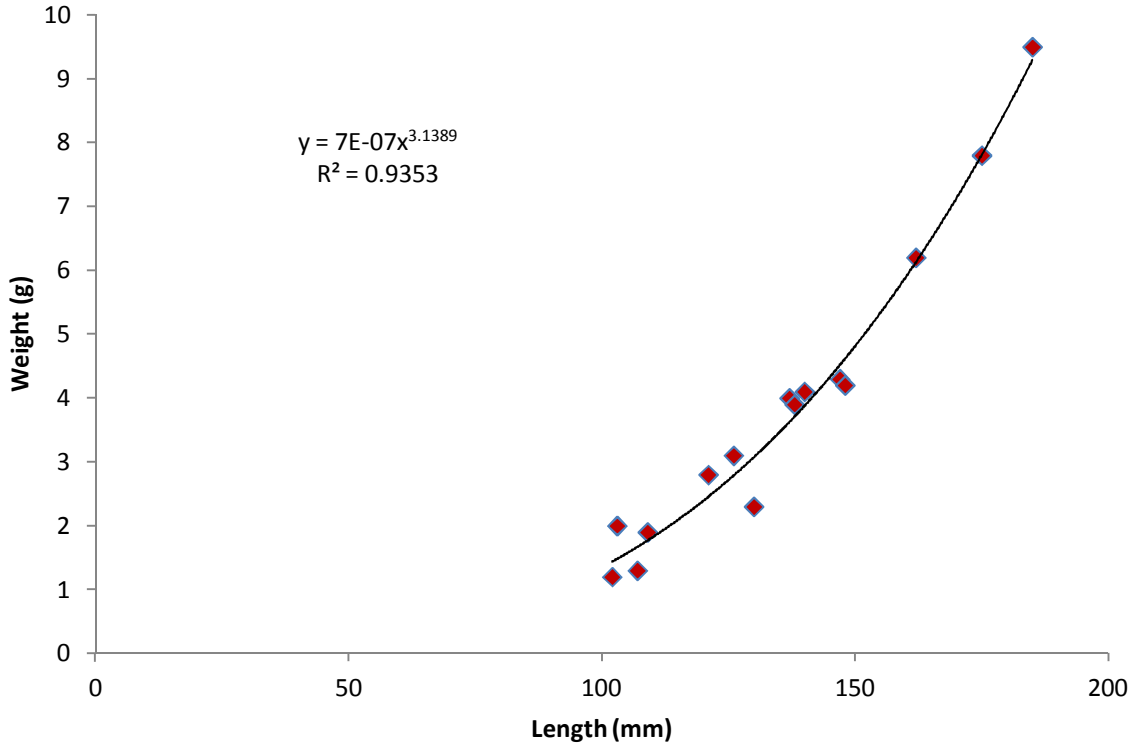

Fig.28 Length weight relationship of juvenile Sea Lamprey at all 29 sites surveyed within the Foyle and Tributaries SAC, 2012 (N=15)

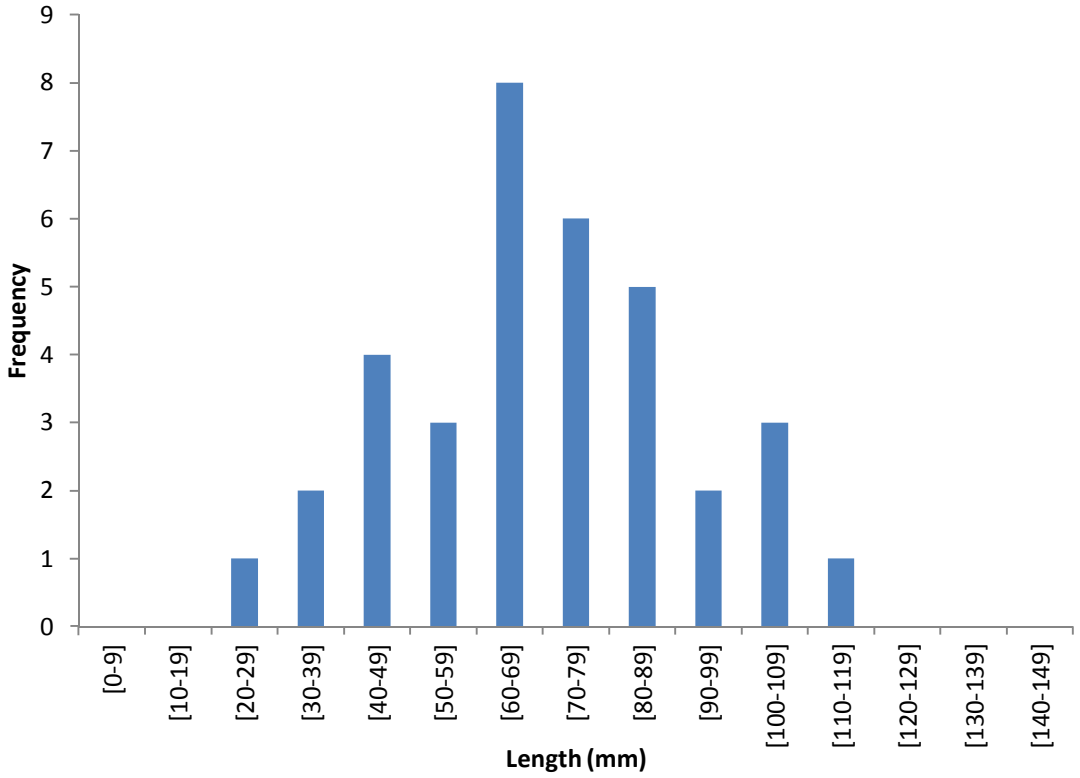

Fig.29 Length frequency distribution of River/Brook Lamprey at site RM001, 2012 (N=35)

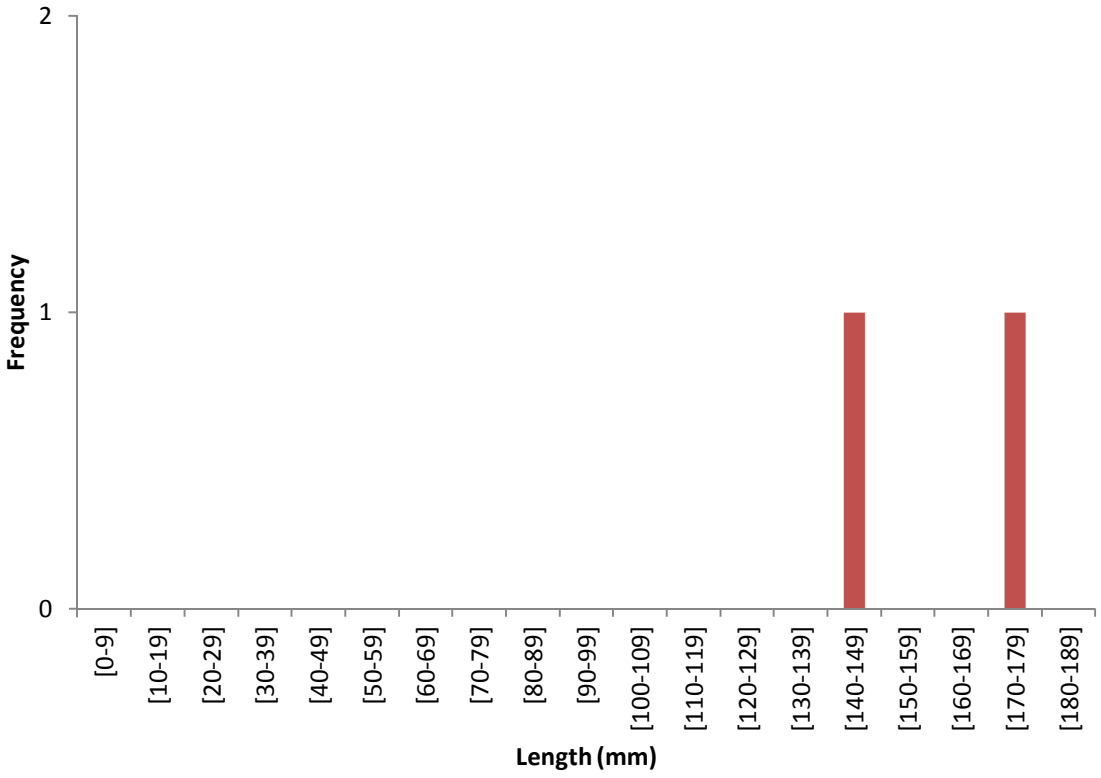

Fig.30 Length frequency distribution of Sea Lamprey at site RM001, 2012 (N=2)

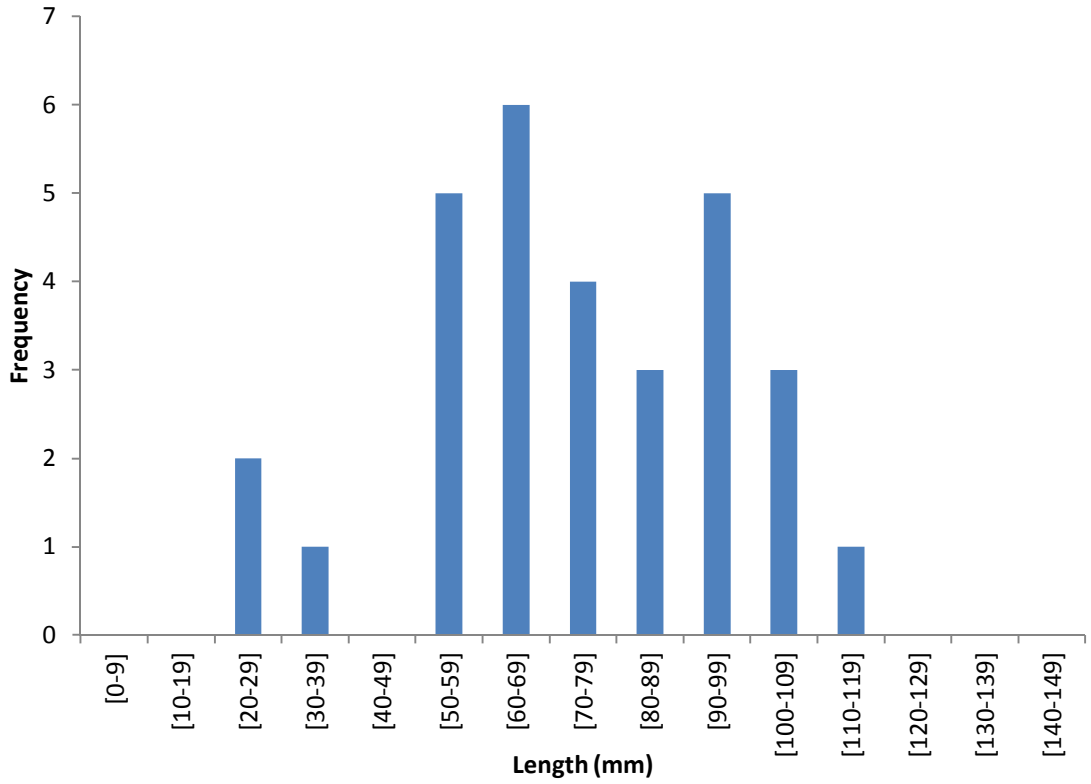

Fig.31 Length frequency distribution of River/Brook Lamprey at site RM003, 2012 (N=30)

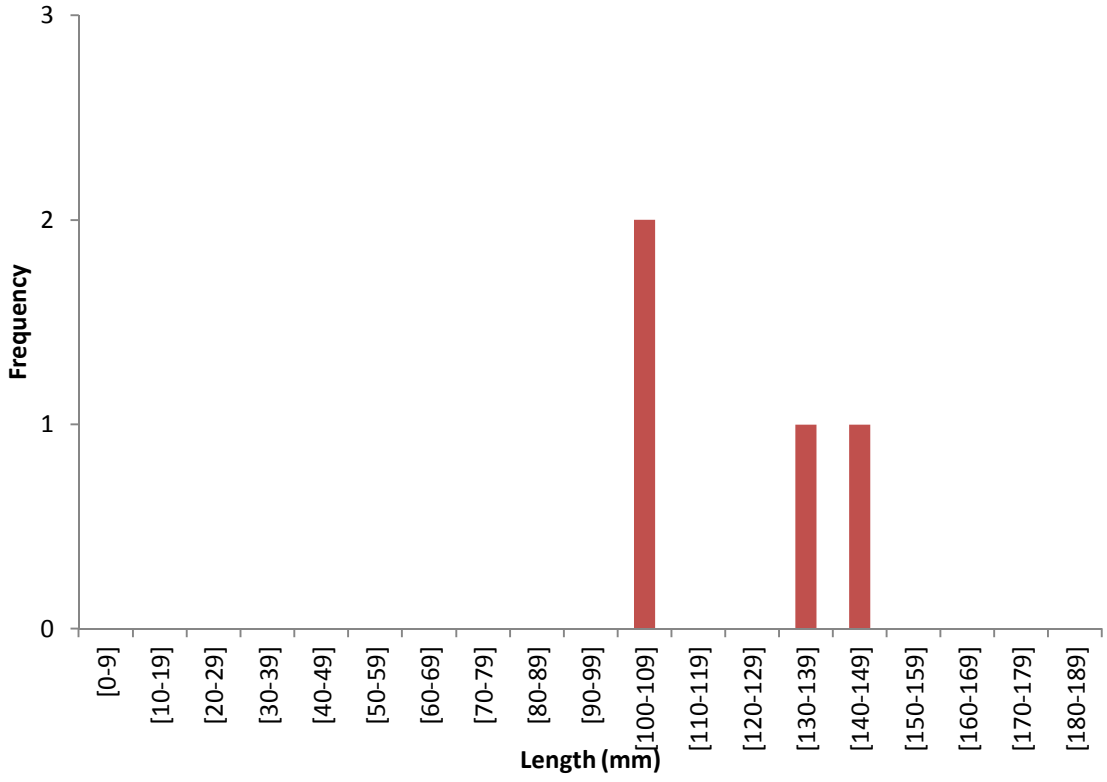

Fig.32 Length frequency distribution of Sea Lamprey at site RM003, 2012 (N=4)

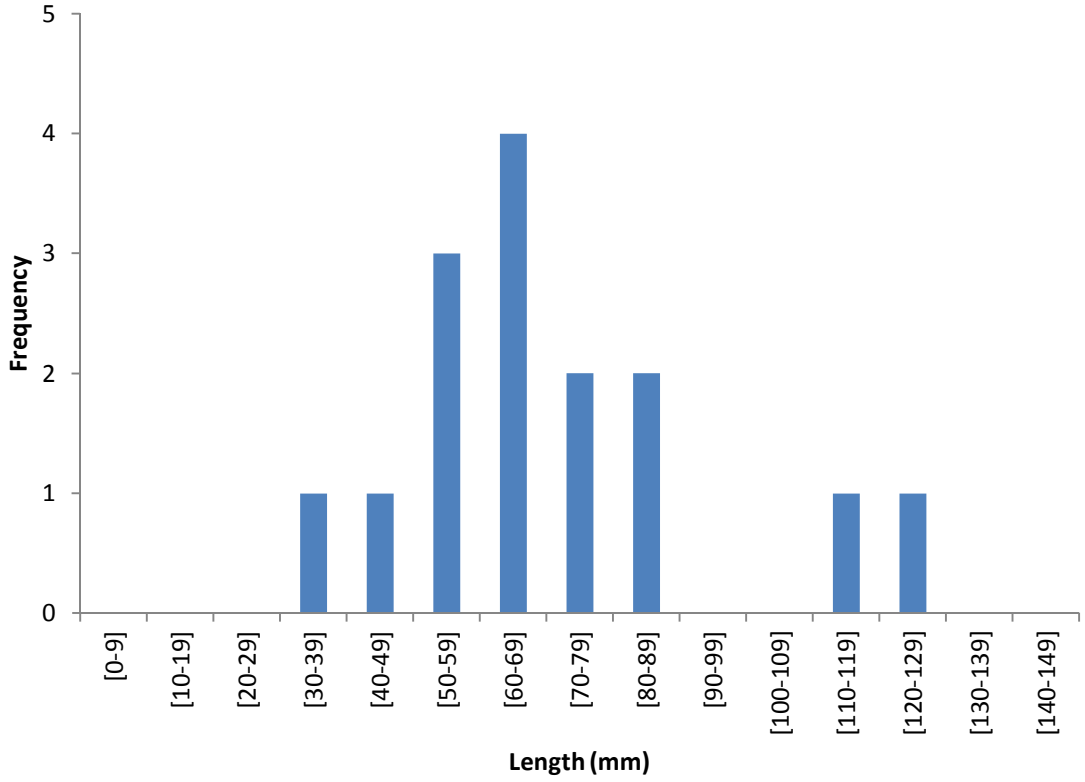

Fig.33 Length frequency distribution of River/Brook Lamprey at site RM004, 2012 (N=15)

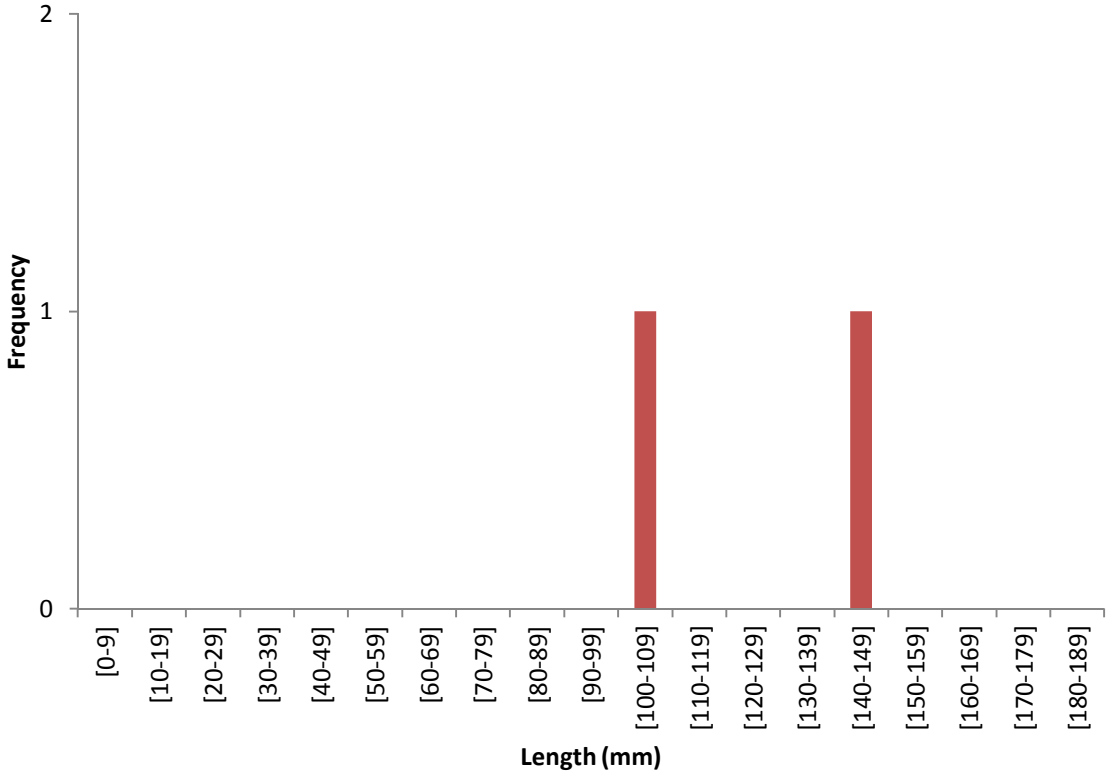

Fig.34 Length frequency distribution of Sea Lamprey at site RM004, 2012 (N=2)

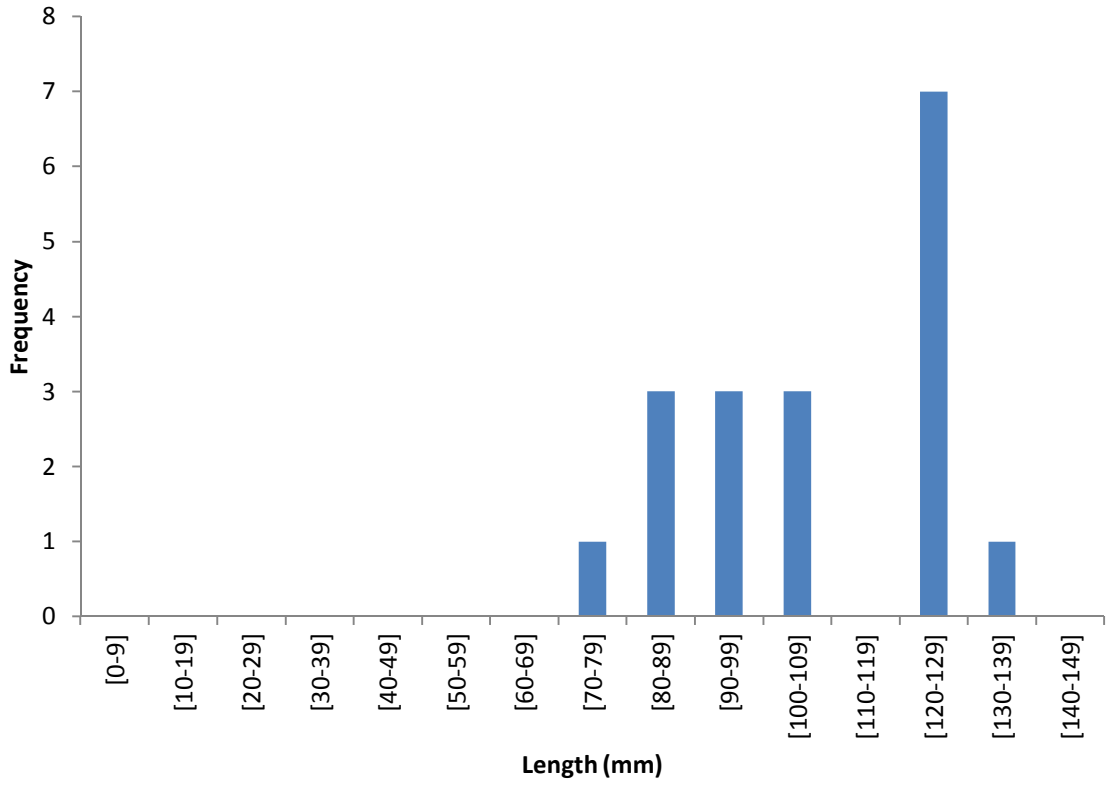

Fig.35 Length frequency distribution of River/Brook Lamprey at site RM005, 2012 (N=18)

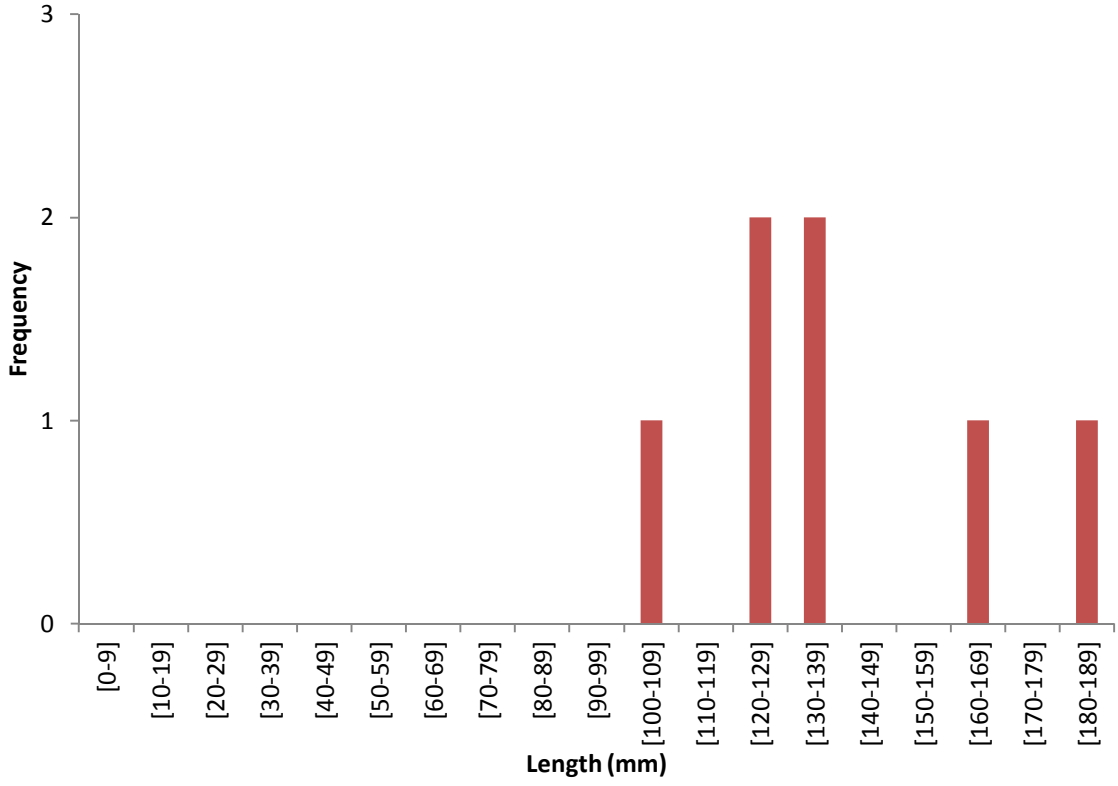

Fig.36 Length frequency distribution of Sea Lamprey at site RM005, 2012 (N=7)

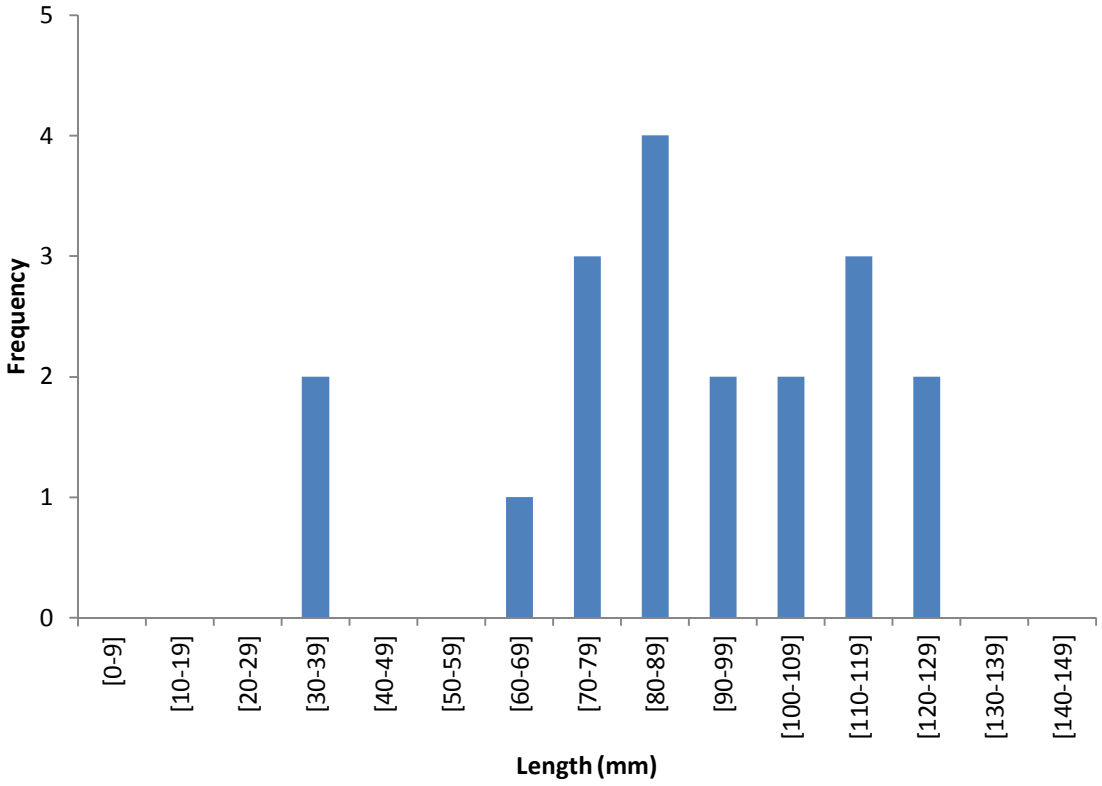

Fig.37 Length frequency distribution of River/Brook Lamprey at site RM006, 2012 (N=19)

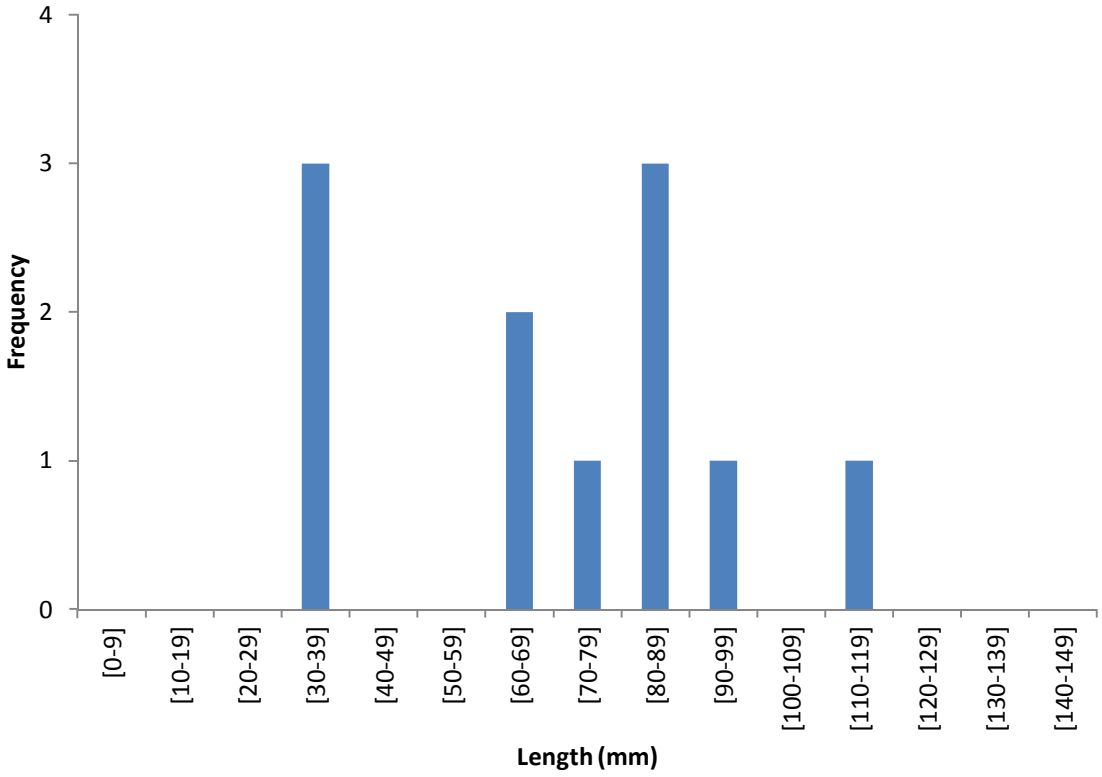

Fig.38 Length frequency distribution of River/Brook Lamprey at site RM007, 2012 (N=11)

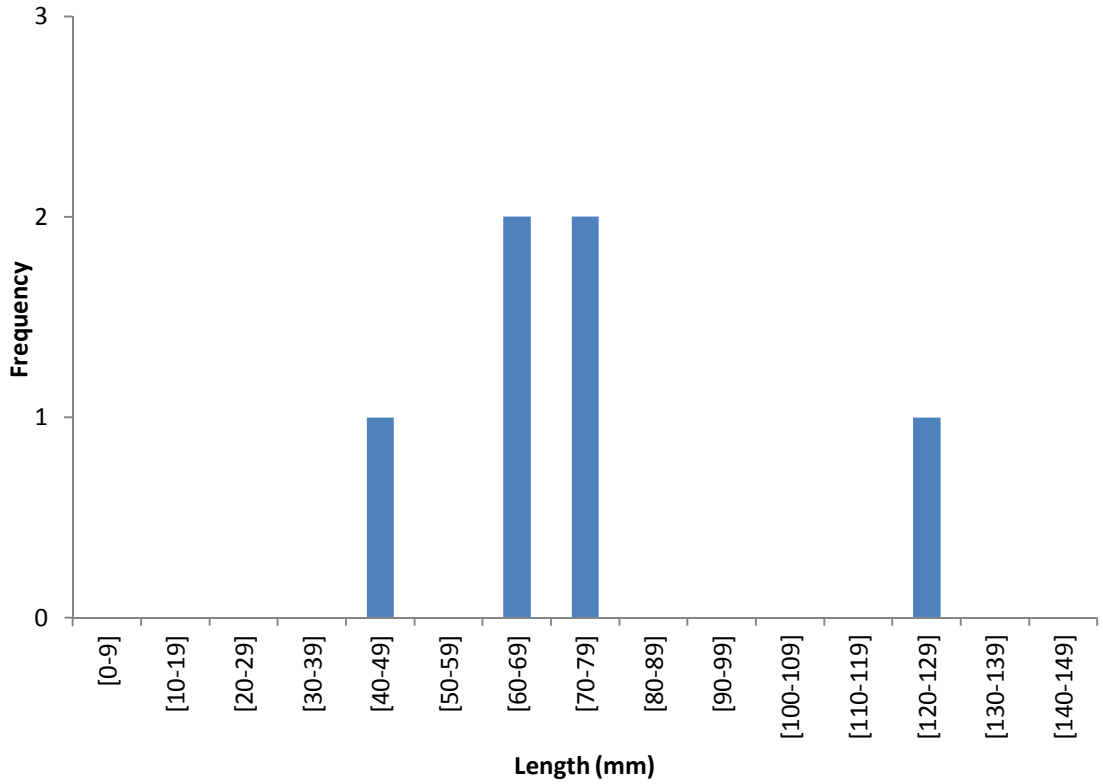

Fig.39 Length frequency distribution of River/Brook Lamprey at site RM008, 2012 (N=6)

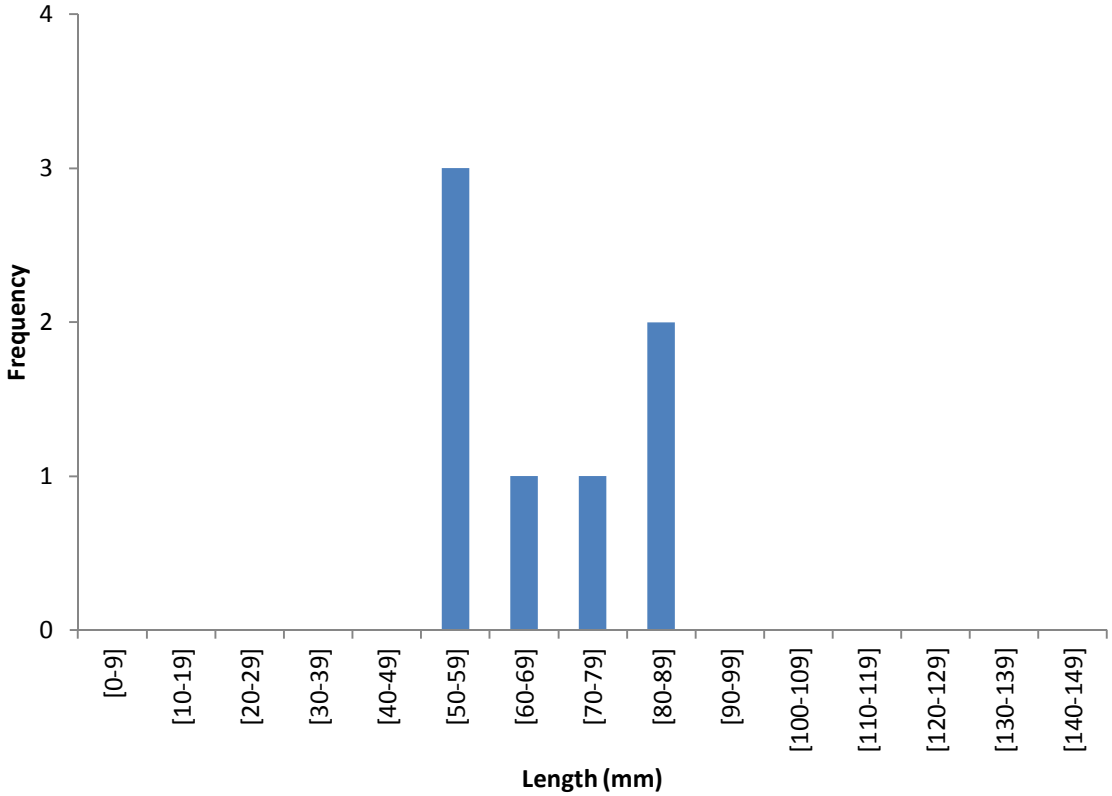

Fig.40 Length frequency distribution of River/Brook Lamprey at site RD002, 2012 (N=7)

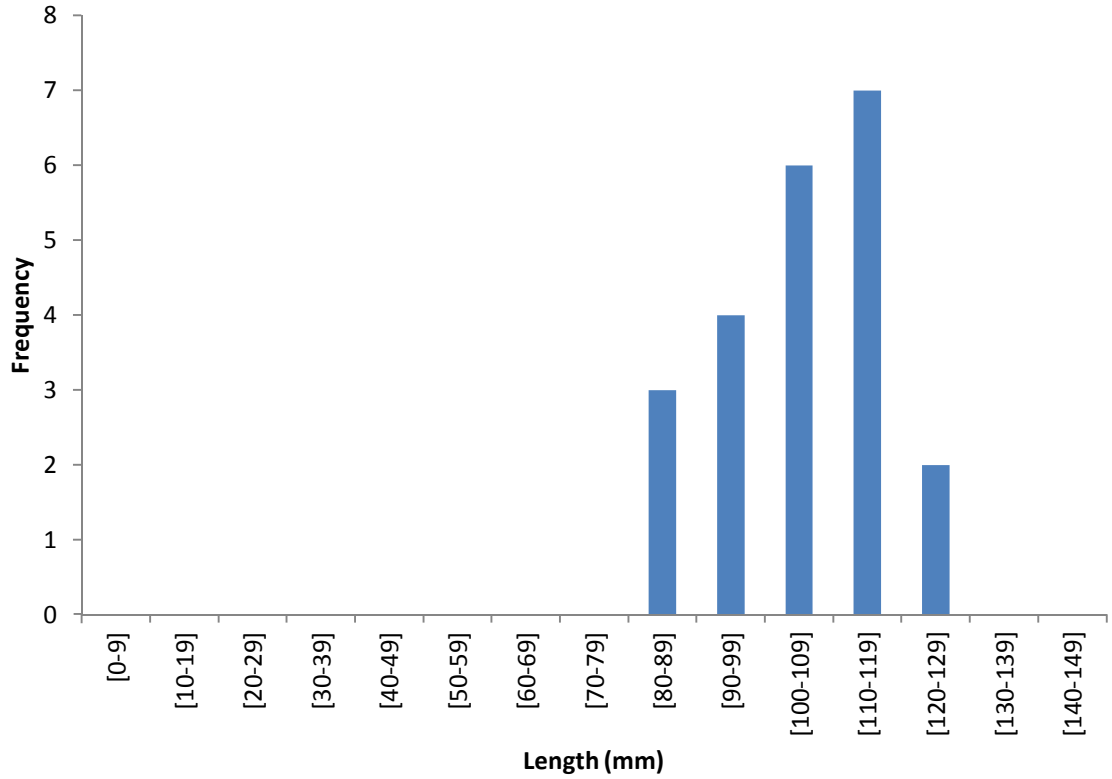

Fig.41 Length frequency distribution of River/Brook Lamprey at site RD003, 2012 (N=22)

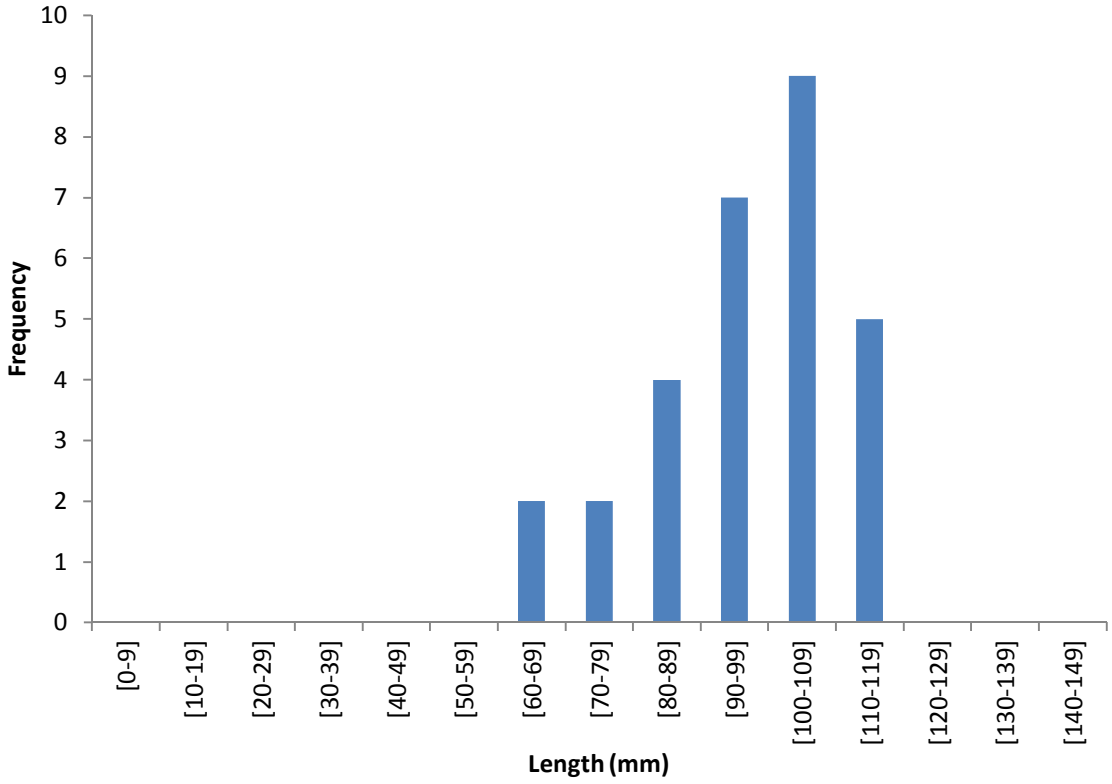

Fig.42 Length frequency distribution of River/Brook Lamprey at site RD004, 2012 (N=29)

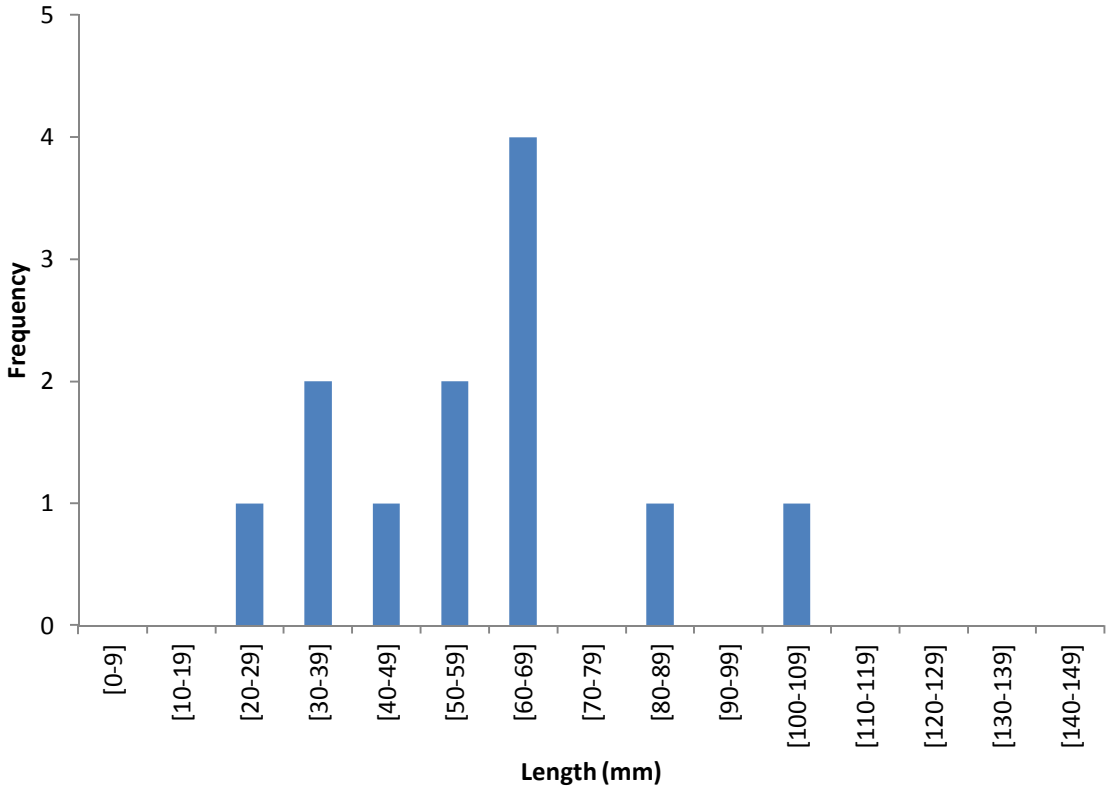

Fig.43 Length frequency distribution of River/Brook Lamprey at site RD005, 2012 (N=12)

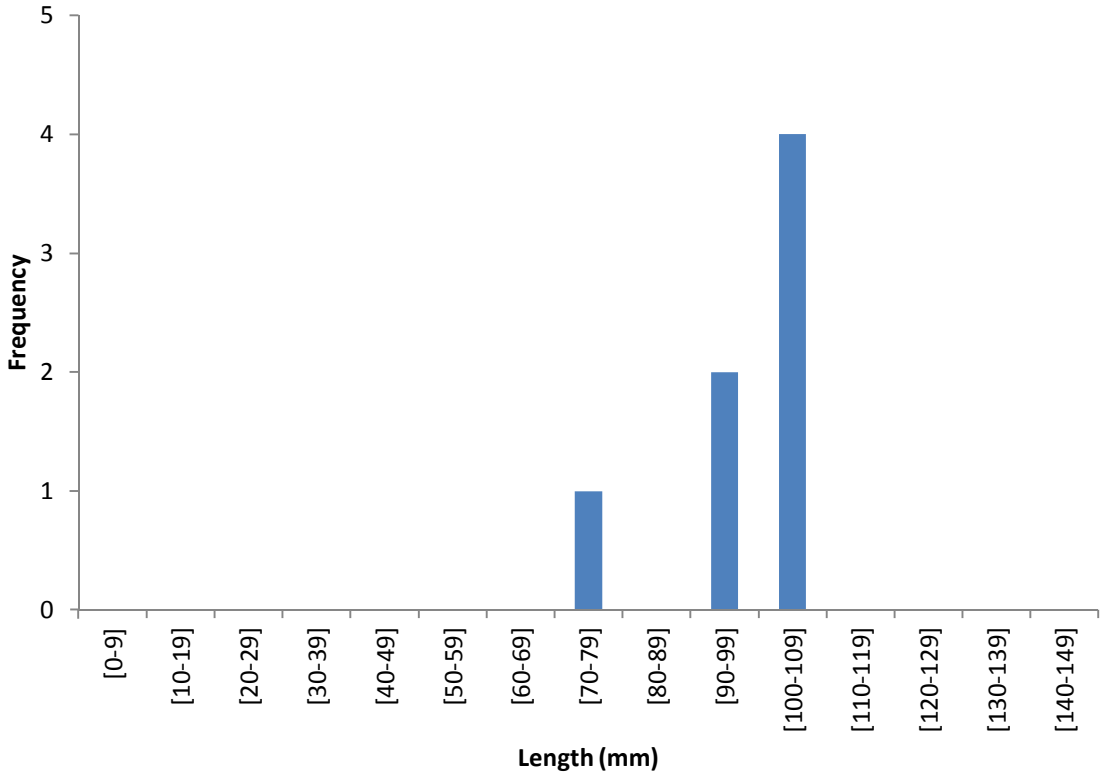

Fig.44 Length frequency distribution of River/Brook Lamprey at site RD008, 2012 (N=7)

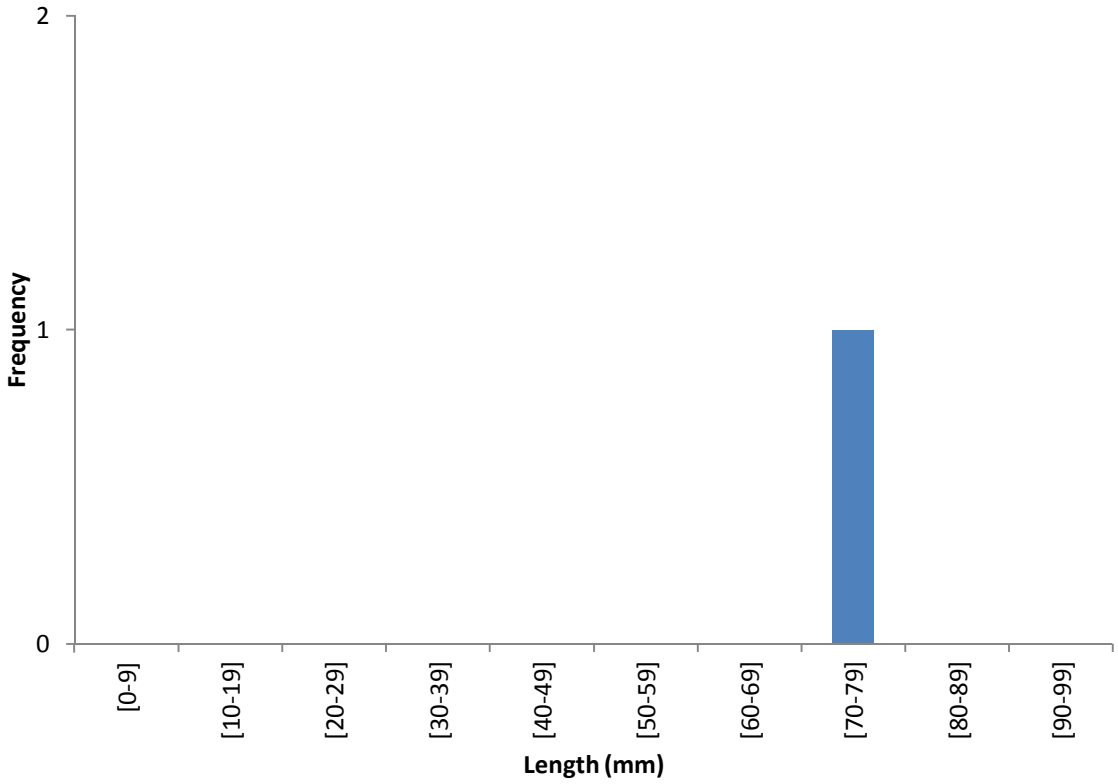

Fig.45 Length frequency distribution of River/Brook Lamprey at site RD013, 2012 (N=1)

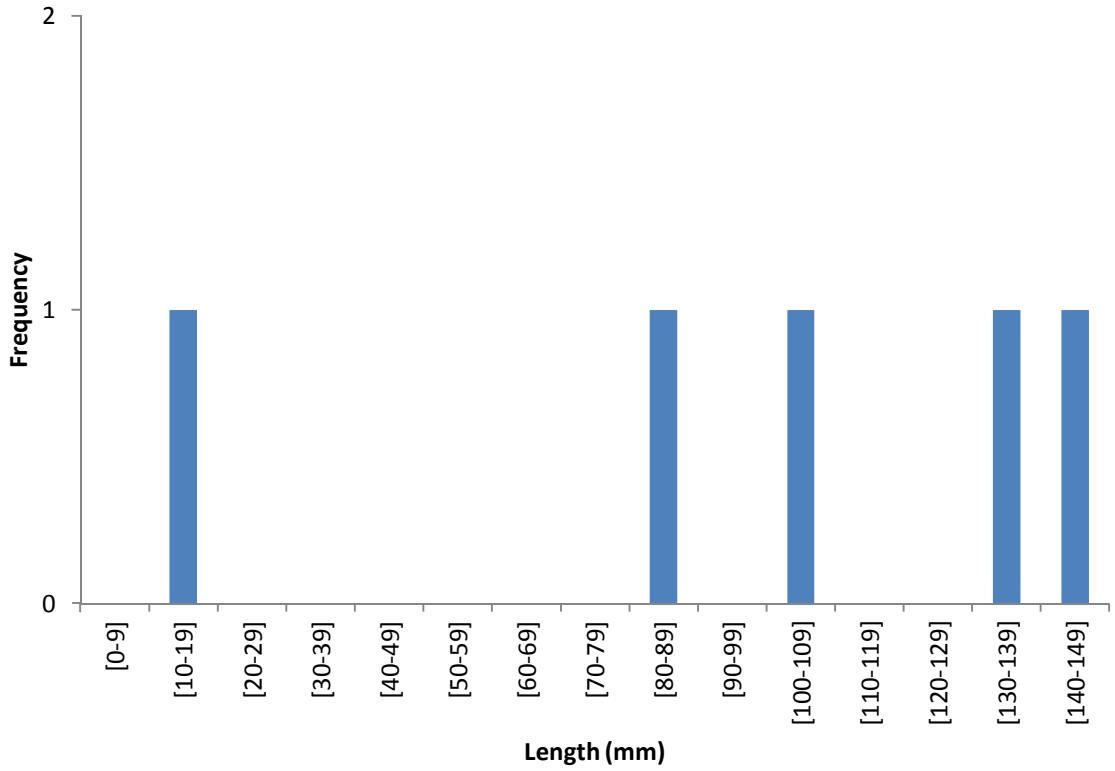

Fig.46 Length frequency distribution of River/Brook Lamprey at site RD015, 2012 (N=5)

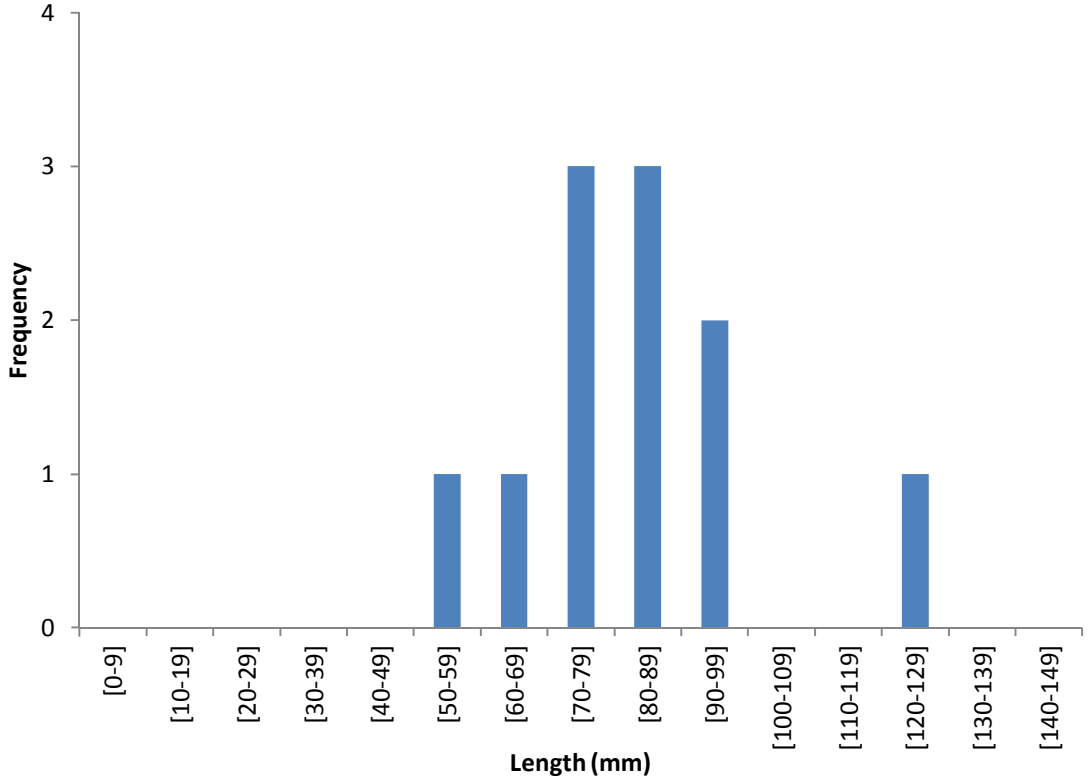

Fig.47 Length frequency distribution of River/Brook Lamprey at site RD018, 2012 (N=11)

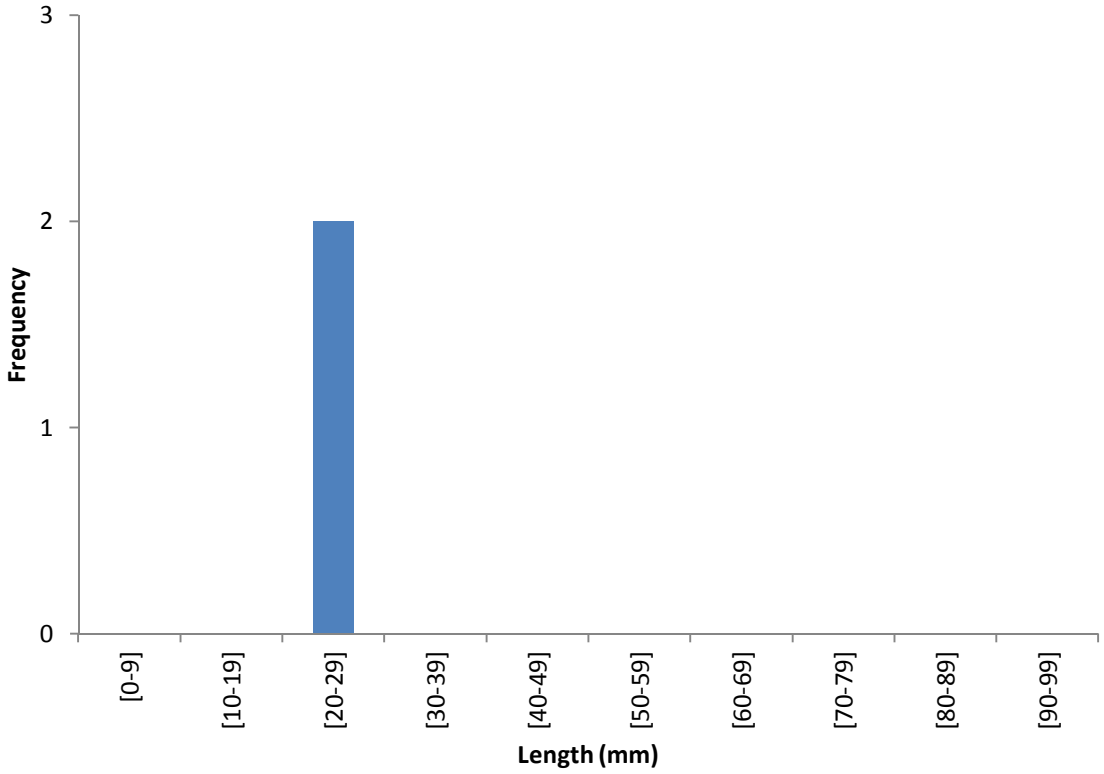

Fig.48 Length frequency distribution of River/Brook Lamprey at site RD019, 2012 (N=2)

Lamprey abundance classification can be conducted in two ways; both methods classify the density of ammocoetes in order to establish the relative condition of lamprey populations within rivers. The first method is a density estimate based on catchment wide surveys including a diversity of habitats. The second method is based on density estimates within optimal habitat. Optimal habitat is defined as stable fine sediment or sand, more than 15 centimetres deep, has low water velocity and the presence of organic detritus. Both methods are presented below for the Foyle and Tributaries SAC for River/Brook lamprey ammocoetes and Sea lamprey ammocoetes. At a catchment perspective, the targets for compliance with favourable conservation status under the Habitats Directive as outlined in Harvey and Cowx, 2003 are >2 per/m² for River/Brook lamprey ammocoetes and 0.1 per/m² for Sea lamprey ammocoetes. At a catchment perspective, mean minimum population densities of River/Brook lamprey ammocoetes at 29 sites within the Foyle & Tributaries SAC was 8.72 per/m². At a catchment perspective mean minimum population densities of Sea lamprey ammocoetes at 29 sites within the Foyle and Tributaries SAC was 0.5 per/m^2. Within optimal habitat, the targets for compliance with favourable conservation status under the Habitats Directive as outlined in Harvey and Cowx, 2003 are >10 per/m² for River/Brook lamprey ammocoetes and 0.2 per/m² for Sea lamprey ammocoetes. Within optimal habitat, mean minimum population densities of River/Brook lamprey ammocoetes at 12 sites within the Foyle and Tributaries SAC was 19.73 per/m². Within optimal habitat, mean minimum population densities of Sea lamprey ammocoetes at 12 sites within the Foyle and Tributaries SAC was 1.21 per/m². Both methods are in agreement that the Foyle and Tributaries SAC are deemed to be meeting favourable conservation status for both River/Brook lamprey and for Sea lamprey. It should be noted that the Foyle and Tributaries area is a designated Special Area of Conservation under the Habitats Directive. All three lamprey species are Annex 2 species. A further assessment was made of the demographic structure of the lamprey ammocoete populations of the catchment, Figures 21-53. Different age class contribution towards the population can be assessed by analysing the length frequency distributions outlined above. Data gathered from the Foyle and Tributaries SAC populations showed at least five age groups/cohorts of River/Brook lamprey, and at least three cohorts of Sea lamprey were present

in the population. It is recommended that in order to achieve favourable conservation status, where abundant River/Brook and Sea lamprey ammocoete populations should have at least two age classes in the population samples from optimal habitat. With reference to distribution, compliance with favourable conservation status should be recorded if there is no decline in distribution from the current or historical pattern.

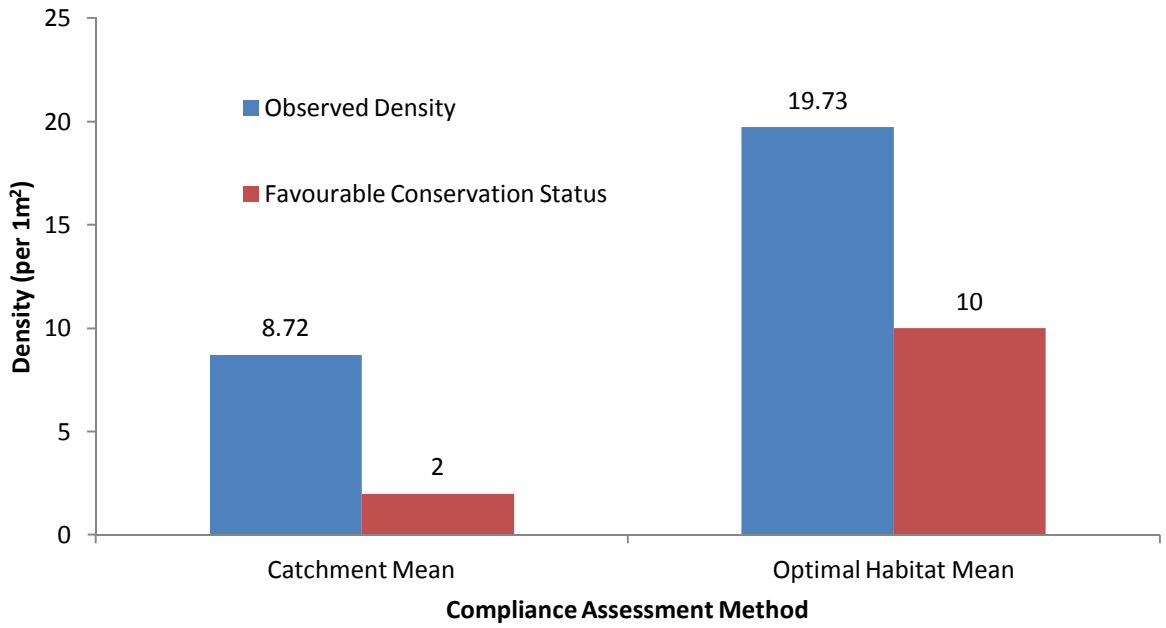

Fig.49 Juvenile River/Brook Lamprey compliance with favourable conservation status

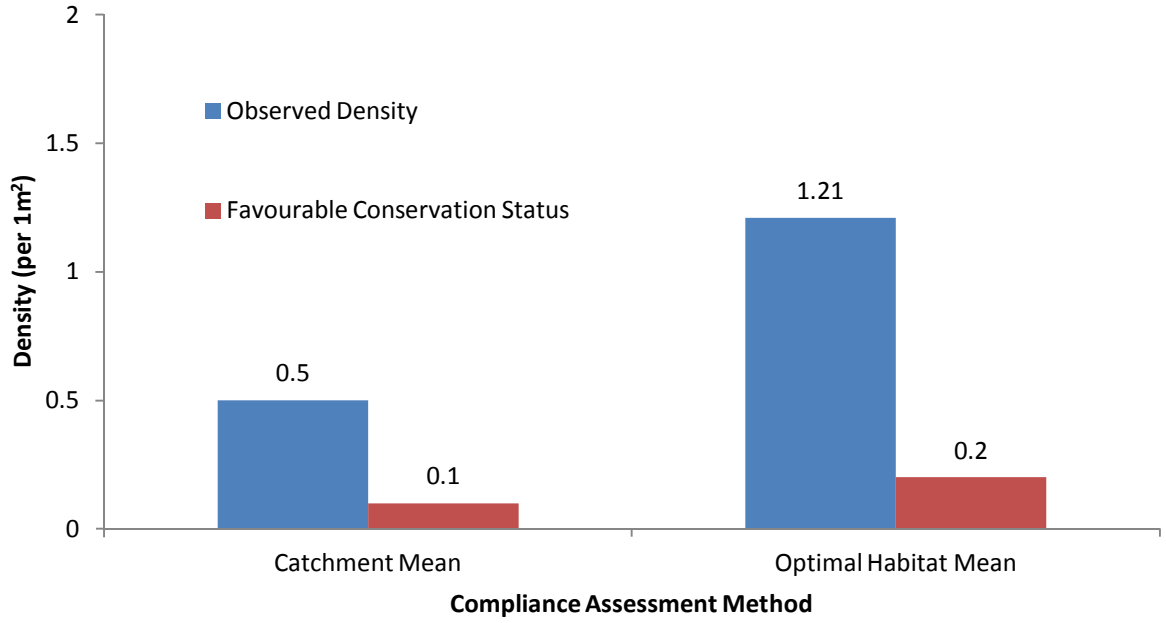

Fig.50 Juvenile Sea Lamprey compliance with favourable conservation status

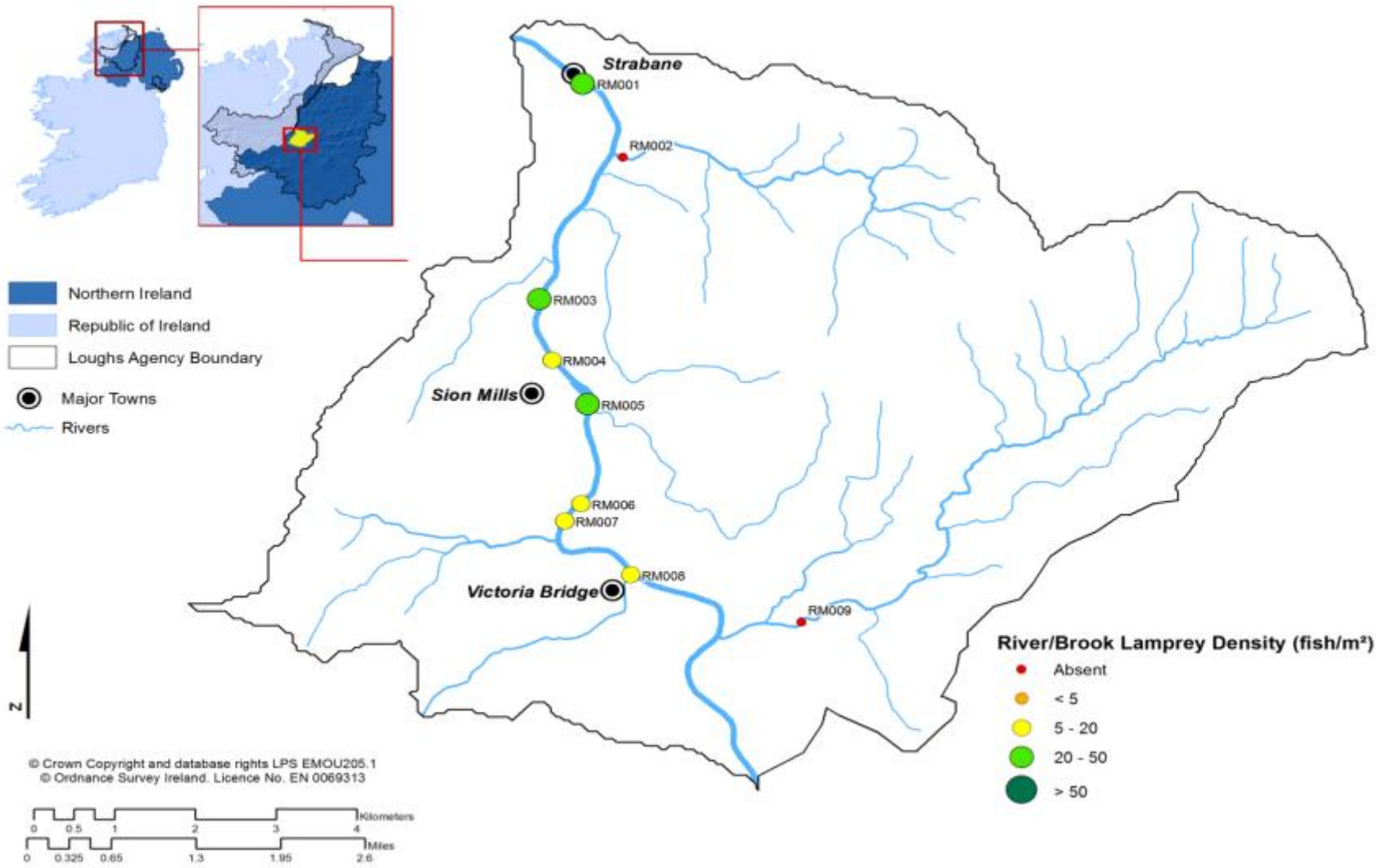

Fig.51 Juvenile River/Brook Lamprey distribution and density within the Mourne catchment, 2012

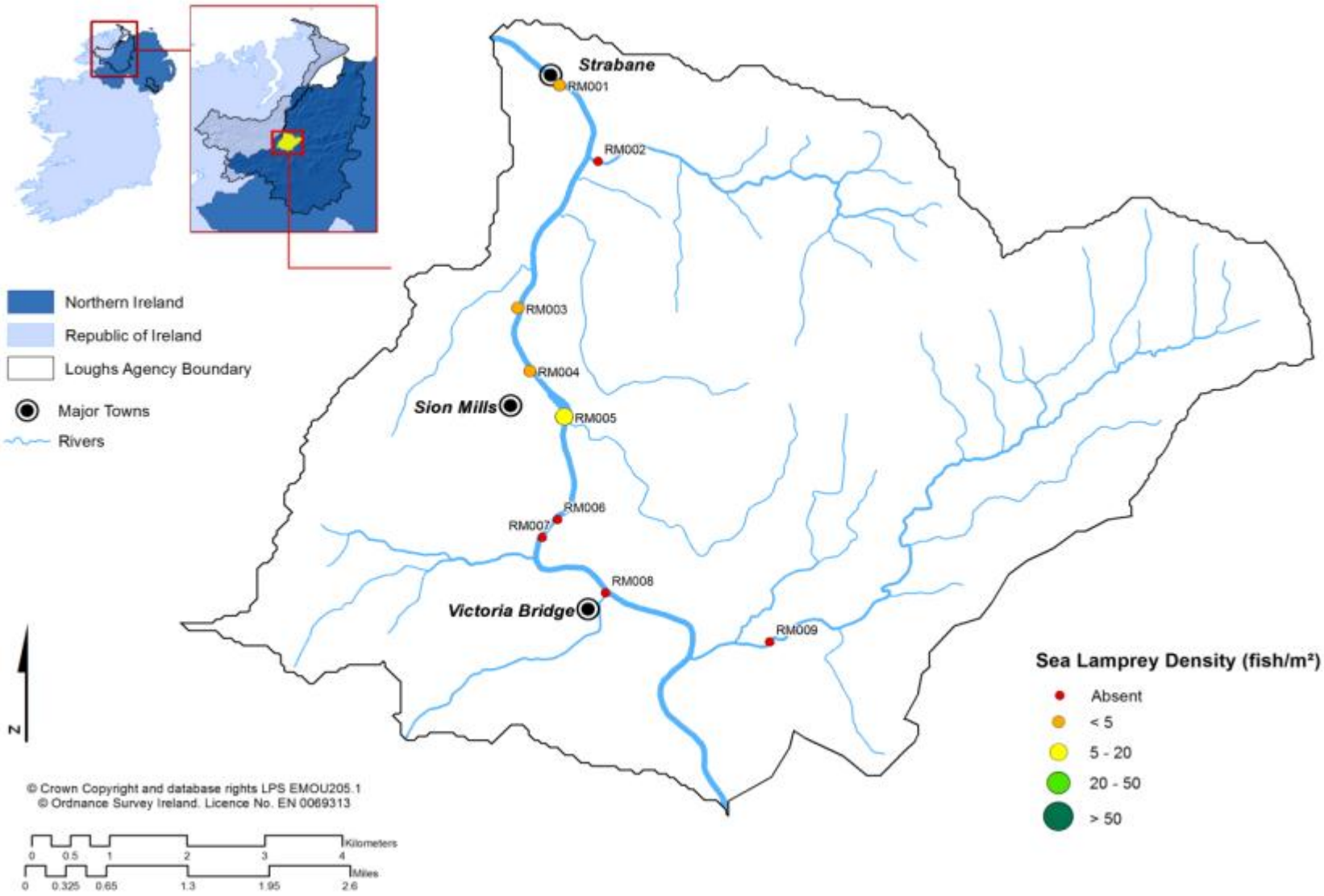

Fig.52 Juvenile Sea Lamprey distribution and density within the Mourne catchment, 2012

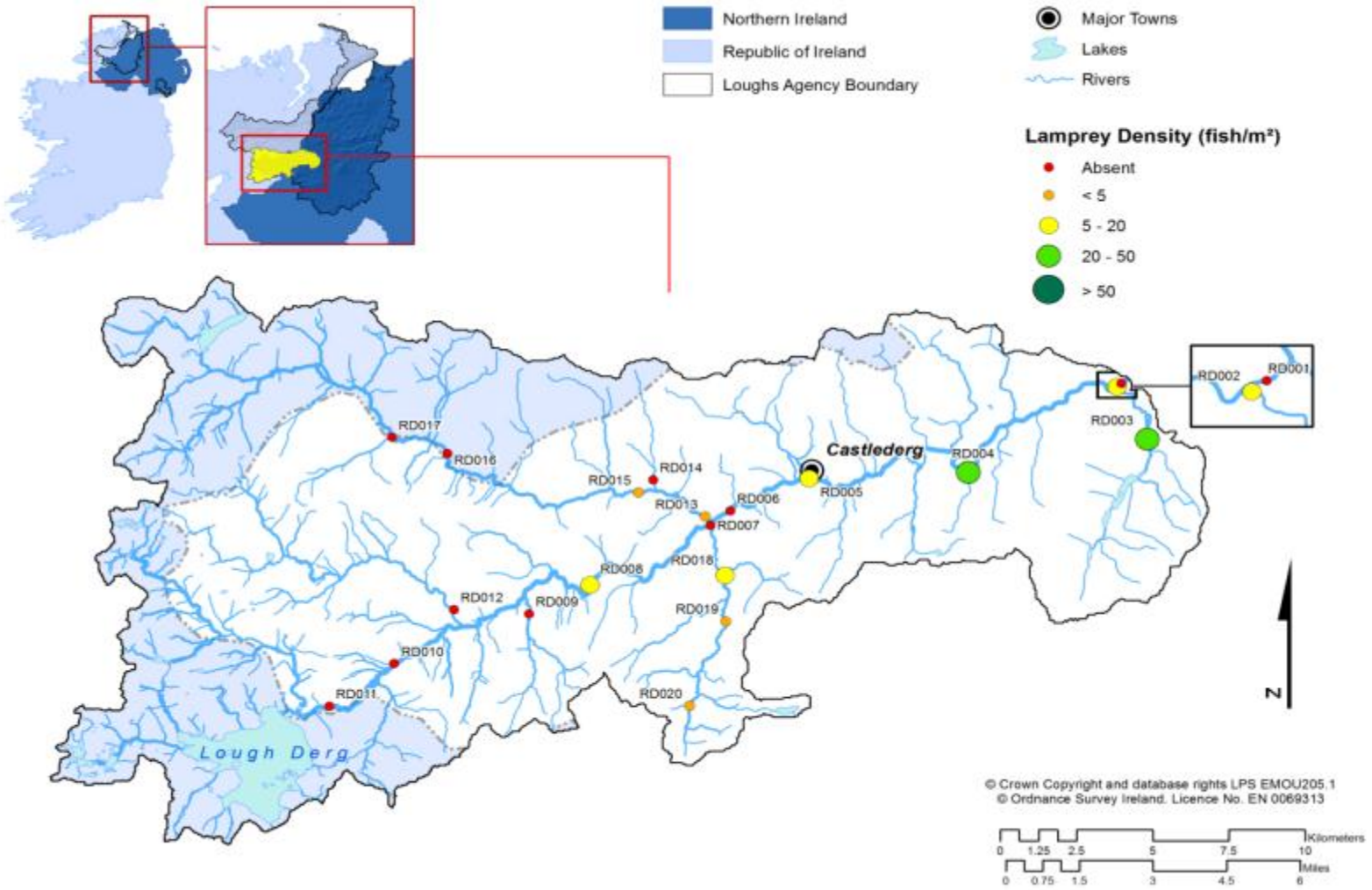

Fig.53 Juvenile River/Brook Lamprey distribution and density within the Derg catchment, 2012. *Note no Sea Lamprey ammocoetes were caught in this catchment during the survey

4.0 DISCUSSION

The status of lamprey ammocoetes within the Foyle and Tributaries SAC are discussed in this section. All ammocoetes found in the current study were either River/Brook lamprey or Sea lamprey. The predominance *of Lampetra* spp is consistent from other studies in Ireland. The presence of anadromous Sea lamprey ammocoetes indicates their ability to undertake anadromous lamprey migrations within the Foyle and Tributaries SAC. However, it is thought that their ability to reach the middle and upper sections of the catchment is severely hindered by barriers to migration. Further investigation involving netting surveys, additional electrofishing surveys, barrier surveys, redd counts and direct observation at spawning time would be required to ascertain this. It has been suggested that Sea lamprey ammocoetes may utilise deeper water habitats which are not covered by the current sampling methodology. APEM conducted lamprey surveys in Scotland and discovered greater utilisation of sediments in deeper pools by Sea lamprey ammocoetes than by River/Brook lamprey ammocoetes. APEM presented some preliminary findings at the Institute of Fishery Management annual conference in 2010. A major benefit of the current sampling methodologies is that it is relatively easy to conduct. Development and utilisation of suction sampling techniques for deeper habitats would add significant complexity to these surveys. The present study did identify juvenile River/Brook lamprey at over half of the sites within the Foyle and Tributaries SAC. The study also identified juvenile Sea lamprey at four of the 29 sites surveyed within the Foyle and Tributaries SAC. Juvenile Sea lampreys were identified at 80% of sites downstream of a significant barrier to migration. Other possible reasons for poor distribution of Sea lamprey ammocoetes could include, the lack of optimal habitat, altitude, limited/no access for anadromous species, gradient and flow characteristics. The most significant of these is the lack of suitable fine sediment deposits. In the Foyle and Tributaries SAC the most appropriate habitat may be in deeper pool areas which could not be sampled using the existing methodology. From the current study it is possible to say that within the Foyle and Tributaries SAC there is reasonable distribution within the habitats surveyed. Distribution is also concentrated in the lower reaches and in some upper tributaries with low gradient where suitable habitat is available and accessible. A barrier to migration assessment should be conducted within the Foyle and Tributaries

SAC to determine the accessible area to migratory lampreys and any necessary easements made. The distribution of Sea lamprey ammocoetes could also be impacted by manmade obstructions/barriers such as weirs. Sea lamprey cannot jump like salmonids and can only pass certain obstructions if flows and gradient permit. This may lead to irregular or no recruitment. Adult Sea lamprey and adult River lamprey have both been observed attached to Sion Mills Weir. Sea lamprey adults (Circa 100) have been observed in early July 2010. River lamprey adults were observed in April/June 2010. Insensitive drainage programmes or de-silting of peripheral water bodies with no obvious fishery interest may also have an impact on the abundance and distribution of all lamprey species. These areas always have fishery potential and should be afforded consideration when developing drainage maintenance schedules. For a channel to successfully function as suitable habitat for lamprey it must contain a balance of the niches required by all the life history stages. For migratory species unimpeded access is required. Spawning habitat and appropriate fine sediment deposits should be available throughout the catchment (King, 2006). The current study has highlighted the capacity of the Foyle and Tributaries SAC to function as good habitat for all the life history stages of lamprey. Access to upstream migrating Sea lamprey is likely to be hampered by the presence of the weir at Sion Mills. The authors would like to highlight that the presence of major barriers within assessed catchments are not considered fully within the Life in UK Rivers Classification document, which could result in misleading classifications or conclusions being drawn.

5.0 RECOMMENDATIONS

• Investigate the potential of radio tracking adult Sea lamprey downstream of Sion Mills weir on the River Mourne. To ascertain spawning locations and passage over Sion Mills weir.

• Develop lamprey fish passage solutions at Sion Mills weir.

• Survey other tributaries not covered in this survey

• Conduct WFD 111 Barrier Assessments.

•Conduct two phase surveys to maximise potential for locating positive habitats.

• Follow up surveys during the spawning season to identify actively utilised habitats.

• Expand juvenile abundance and distribution surveys out to other catchments within the Foyle and Carlingford areas, prioritising SAC catchments.

• Regularly update records of lamprey within the Foyle and Carlingford areas into the GIS spatial database for lampreys created as part of the current project.

• Conduct direct observation/redd counting in areas of suitable habitat at spawning time.

• Conduct netting surveys at migration time to ascertain presence of anadromous lamprey.

• Develop and conduct tests in deeper pool areas using some form of suction sampling to assess distribution of Sea Lamprey ammocoetes.

• Investigate the potential for conducting tagging studies to assess the extent of migrations and habitat utilisation.

• Develop and promote sensitive catchment management practices specific to lamprey populations including advice to drainage authorities carrying out channel maintenance.

• Develop education materials for drainage authority personnel and sub contracted operatives.

• Understand the potential to conserve and protect lamprey populations for their biodiversity value and ability to provide ecosystem services.

• Understand the significant potential to obtain EU funding for relevant conservation projects within the Foyle and Carlingford areas incorporating lamprey conservation as a component.

• Raise awareness and understanding of lamprey populations of the Foyle and Carlingford area.

• Develop index reaches to conduct redd counts and spawning observations.

• Collaborate on future lamprey research projects with a focus on genetic analysis.

6.0 CONCLUSIONS

The current study has concluded that both River/Brook lamprey populations and Sea lamprey populations within the Foyle and Tributaries SAC are in favourable conservation status. As outlined above there may be issues regarding site selection and sampling techniques for Sea lamprey ammocoete habitats. As further studies are conducted within the Foyle and Carlingford areas comparisons will be made with the Foyle and Tributaries SAC survey and if necessary changes to the sampling methodology made. Reporting on the conservation status of designated fish species in river SAC's is a statutory requirement for member states of the European Union. Protocols and methodologies developed as part of the LIFE in UK Rivers Project should act as a generic framework for condition assessment in the UK and other EU Member States (Cowx et al, 2009). This report is based on surveys conducted using compliant survey methodologies, but should not be interpreted as a full site condition assessment.

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