LOUGHS AGENCY OF THE FOYLE CARLINGFORD AND IRISH LIGHTS COMMISSION

Stillwater Status Report: Enagh Lough East

Stillwater Fish Stock Survey

Loughs Agency of the Foyle Carlingford and Irish Lights Commission

Art Niven & Mark McCauley

March 2017

A lake fish stock assessment was conducted to record indicative species composition and abundance of Enagh Lough East during the summer of 2016.

Headquarters
22, Victoria Road
Derry~Londonderry
BT47 2AB
Northern Ireland

Tel: +44(0)28 71 342100

Fax: +44(0)28 71 342720

general@loughs-agency.org

www.loughs-agency.org

Regional Office
Dundalk Street
Carlingford
Co Louth
Republic of Ireland

Tel+353(0)42 938 3888

Fax+353(0)42 938 3888

carlingford@loughs-agency.org

www.loughs-agency.org

Report Reference LA/Lake/08/17
CITATION: Niven, A.J. & McCauley, M. (2017) Stillwater Status Report: Enagh Lough East. Loughs Agency, 22, Victoria Road, Derry~Londonderry

DOCUMENT CONTROL

Name of Document	Stillwater Status Report: Enagh Lough East				
Author (s):	Art Niven & Mark McCauley				
Authorised Officer:	John McCartney				
Description of Content:	Stillwater Fish Stock Assessment				
Approved by:	John McCartney				
Date of Approval:	March 2017				
Assigned review period:	5 Years				
Date of next review:	March 2021				
Document Code	LA/LAKE/09/17				
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 M. McCauley	John McCartney	John McCartney	March 2021
Revision 2					
Revision 3					
Version 3					

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

The Loughs Agency sponsoring departments, board and staff are gratefully acknowledged for the funding, support and assistance provided to conduct stillwater fish stock assessments and status reporting in the Foyle and Carlingford areas. The Fishery owners (The Honourable the Irish Society) and the lease holder of the fishery (Strathfoyle Community Development Association) are also gratefully acknowledged for their co-operation.

PROJECT STAFF 2016

Fisheries Biologist/Project Manager	Art Niven
Assistant Scientific Officer	Mark McCauley
GIS Manager	Rachel Scott
Fisheries Intern	Dineka Maguire
Fisheries Intern	Seanan Maguire

For further information contact art.niven@loughs-agency.org

@ArtNiven **Loughs Agency TV**

EXECUTIVE SUMMARY

A Water Framework Directive compliant stillwater fish stock assessment was carried out on Enagh Lough East in September 2016. The Loughs Agency commenced a small rolling programme of lake fish surveys in 2010 to gain a better understanding of fish composition and abundance of the standing waterbodies within the Foyle and Carlingford areas. The information collected can be used to derive a formal Water Framework Directive classification, a baseline survey for use in the scrutiny of any future development proposals or for contributing towards the sustainable development of the angling amenity.

Enagh Lough East is situated approximately 4km north east of Derry~Londonderry. Enagh Lough East was selected as no previous baseline scientific fisheries survey had been conducted on the lough and no accurate depth (bathymetry) data was available. In order to be able to follow the WFD survey methodology it was necessary to complete a bathymetric survey prior to the commencement of the lake fish survey. A stocked Rainbow trout and Pike fishery is operated on the adjacent Enagh Lough West, the two lakes are approximately 200 metres apart.

The 2016 fish stock assessment noted the presence of several fish species in Enagh Lough East including Pike, European eel, Roach, and Perch with a total of 607 individual fish captured during the survey. Roach *(Rutilus rutilus)* and Perch (*Perca fluviatilis*) were by far the most common fish species encountered as demonstrated by the similar catch per unit effort recorded for both species.

This is the first scientific lake survey report on Enagh Lough East and provides a baseline survey of species and their relative abundance to fishery managers and anglers alike. It is anticipated that this survey report could significantly contribute towards any future sustainable development of angling initiatives, infrastructure or development plans for the lough, and provide the basis for an evidence based approach to the management of the lough.

If access to the Fish in Lakes 2 Water Framework Directive classification tool was available a WFD compliant classification could also be derived for Enagh Lough

East and provided to the Northern Ireland Environment Agency for national reporting purposes.

1.0 INTRODUCTION

Enagh Lough East is located approximately 4km north east of Derry City, in the Foyle catchment. The lake is located at an altitude of approximately 20 metres above sea level and its principal dimensions are;

- Length: 550m long, maximum width 450 metres
- Surface area: 13.7 hectares
- Maximum depth: 10 metres

Fig 1. Stillwater Fish Survey being carried out on Enagh Lough East, 2016.

2.0 BATHYMETRY SURVEY

Prior to the lake fish survey being carried out it was essential to obtain accurate depth data for the lake. It is a prerequisite of any WFD compliant lake fish survey

to have detailed bathymetry data, so that the survey can be carried out in accordance with the standard sampling methods for the assessment of ecological status in freshwater lakes across the island of Ireland (Eco-region 17). The area of the lake (ha) and the maximum depth are used to determine the distribution and number of gill nets required for the survey. A Midas Surveyor, integrated echo sounder, GPS and data logger was used to collect raw depth data linked to a geographical location. This logged data was then used to produce a lake bathymetric chart. The echo sounder transducer was secured to a pole which was then attached to the gunnel of the survey boat using a clamp. The transducer was positioned below the surface of the water with the GPS antennae attached to the top of the pole. Both were connected by cables to the echo sounder logging unit. The bathymetry survey consisted of covering transects of approximately 20m spacing across the lough. Depth and location were recorded at a resolution of three records per second. The raw data was downloaded from the echo sounder back in the office and imported into ArcMap 10. The data points were then extrapolated to produce an overall bathymetry map for Enagh Lough East.

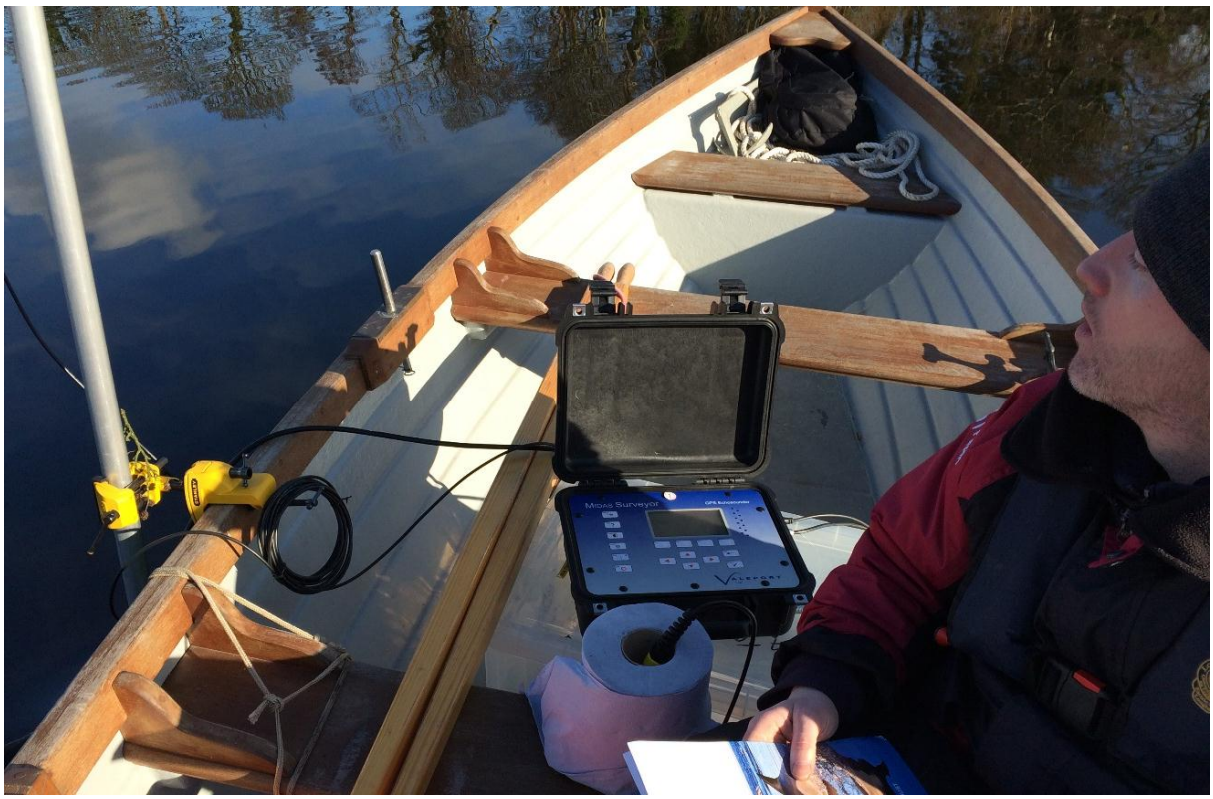

Fig 2. Echo sounder recording data points during the bathymetry survey of Enagh Lough East.

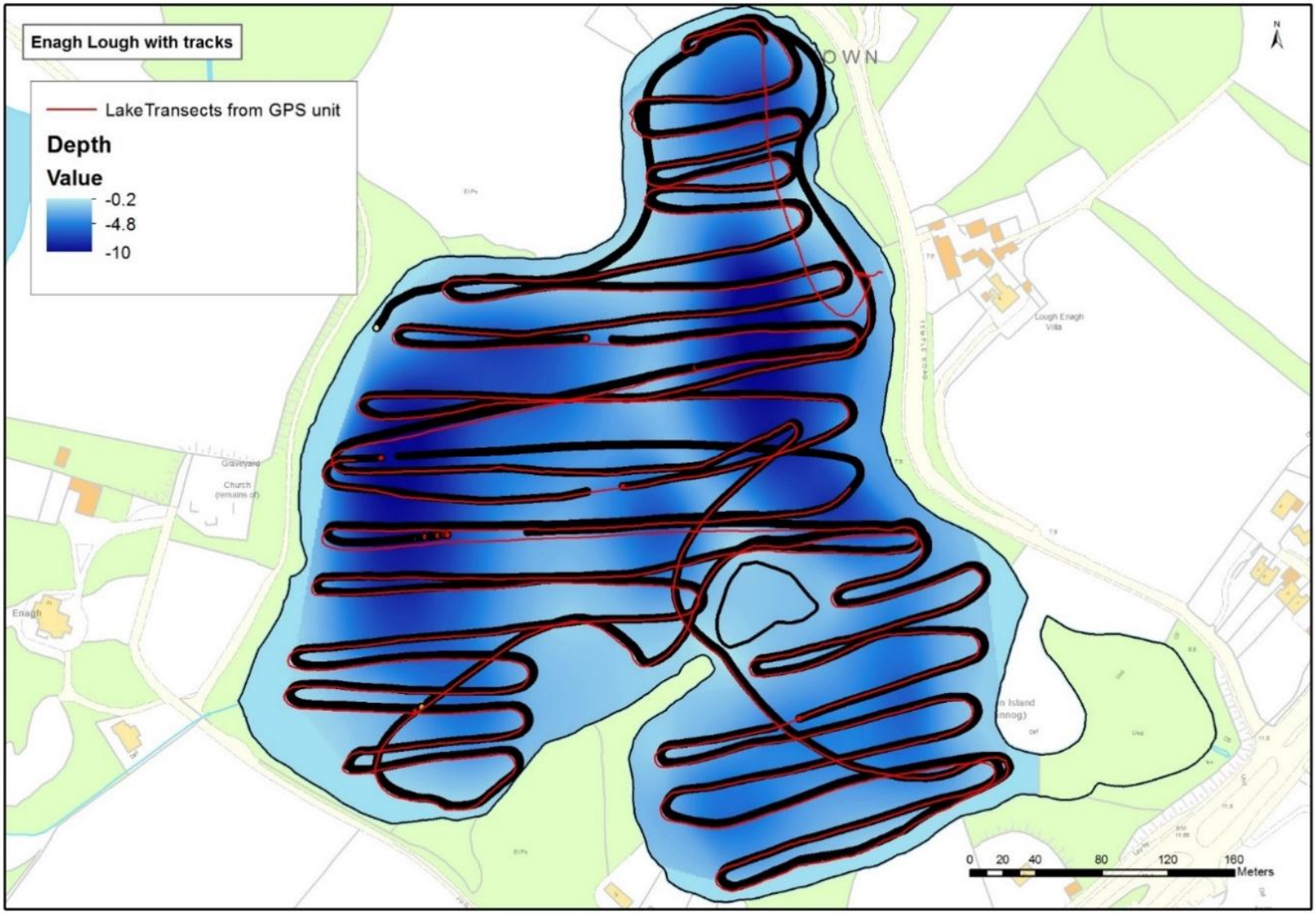

Fig 3. Enagh Lough East with transects and GPS

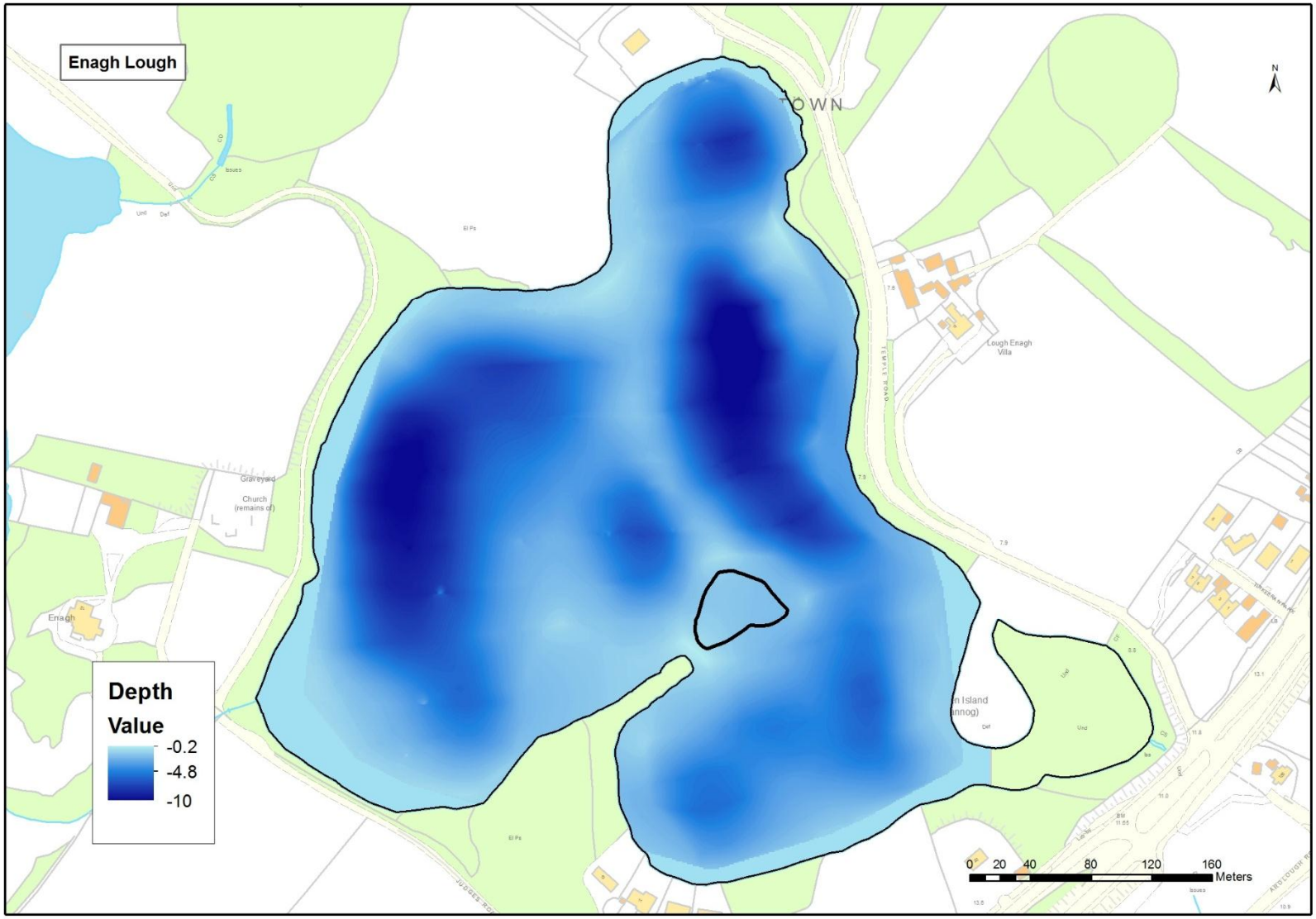

Fig 4. Enagh Lough East bathymetric map

3.0 METHODS

Enagh Lough East was surveyed over one night from the 13th of September 2016 according to the methodology described in the Water Framework Directive compliant NS Share Methods Manual for systematic surveying of lakes for fish (NSSHARE, 2008). A total of 11 nets were set as summarised in Figure 5 below.

Net type	No. Deployed	Water depth (m)
Dutch fyke nets (chain of 3)	3	0 – 2.9
Multi-mesh gill nets	2	0 – 2.9
Multi-mesh gill nets	2	3 – 5.9
Multi-mesh gill nets	2	6 – 11.9
Multi-mesh floating nets	2	12 – 19.9

Fig 5. Details of survey nets deployed on Enagh Lough East.

Fig 6. Nets being prepared at Loughs Agency headquarters for survey on Enagh Lough East.

Survey locations were chosen within randomly selected 50m X 50m grid squares overlaid on a bathymetric map of the lough (Figure 7). The location and depth of each net is also shown. A handheld Trimble Geo HT GPS was used to record the precise location of each net (Figure 8). Any fish which were alive and in good condition were measured and released live after removal from the nets, this included all eels. All other fish were removed from the nets and identified and measured at Loughs Agency headquarters.

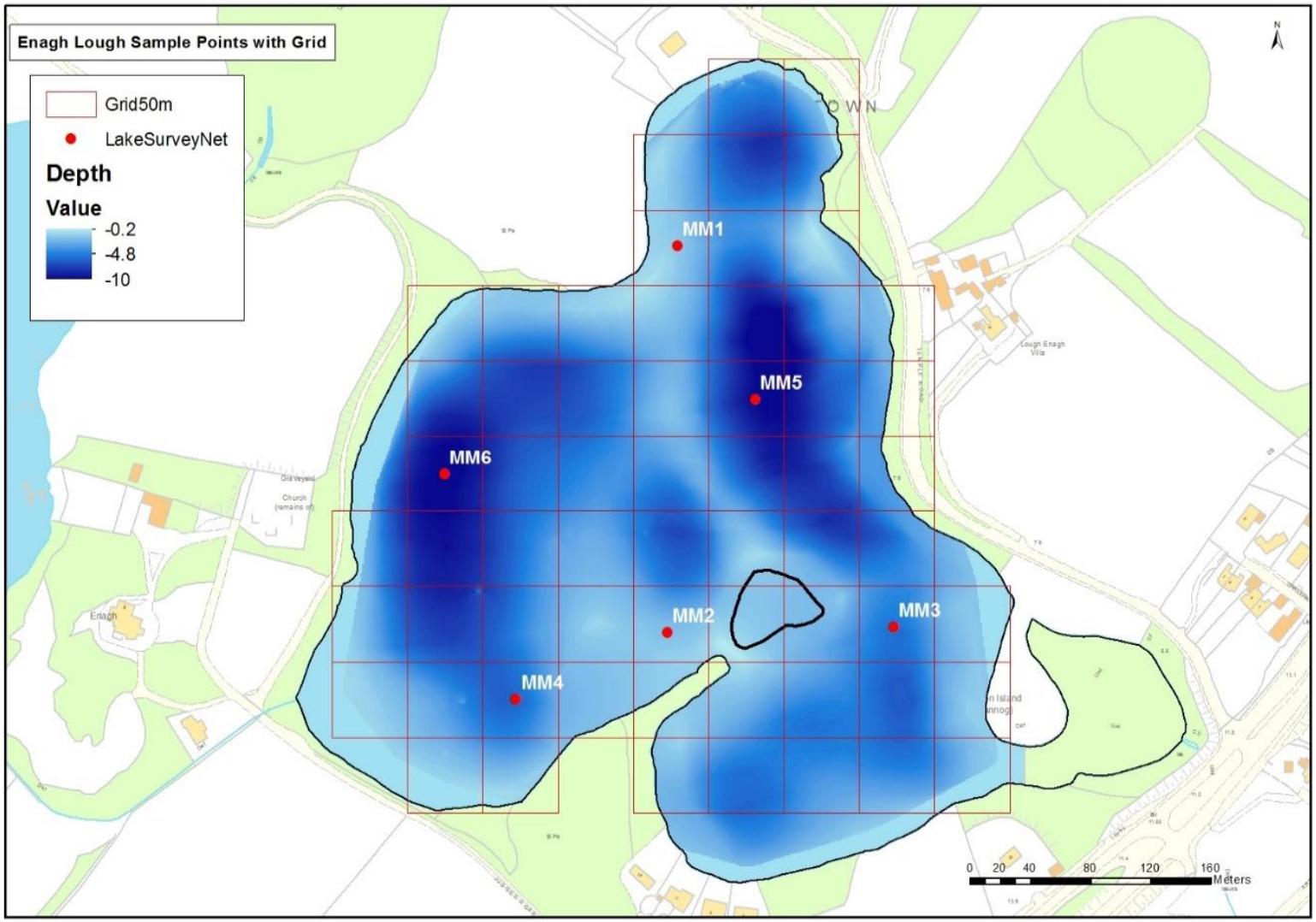

Fig 7. Enagh Lough East bathymetry map overlaid on 50m grid squares.

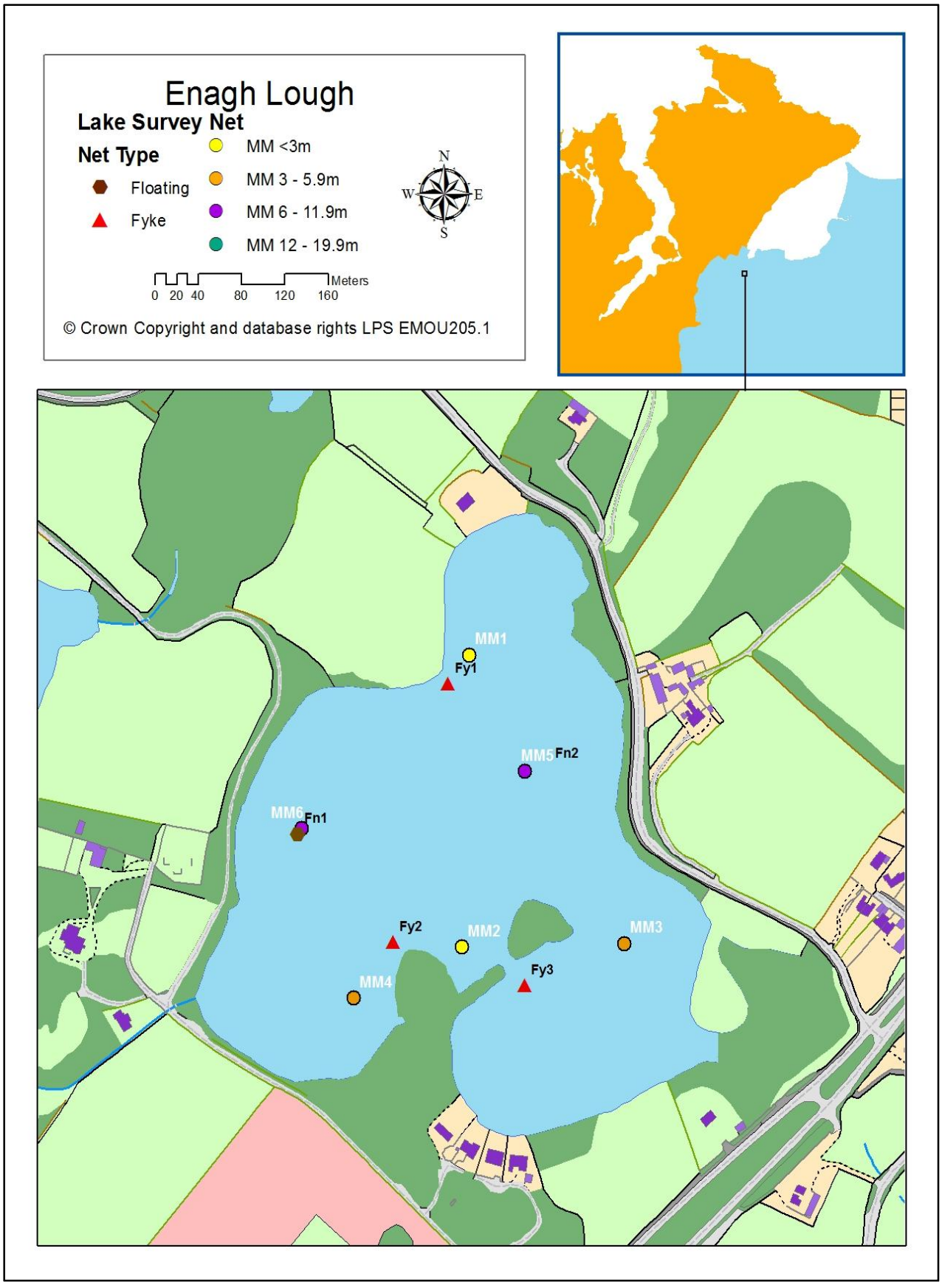

Fig 8. The precise location of each net was recorded using a handheld Trimble Geo HT GPS.

4.0 RESULTS

4.1 SPECIES RICHNESS

A total of four fish species were recorded on Enagh Lough East in September 2016 with a total of 607 fish captured during the survey. A list of species encountered and captured by each gear type is compiled in Figure 9. Roach *(Rutilus rutilus)* were the most common fish species encountered in the benthic gill nets. One European eel was caught in the fyke nets.

Common name	Scientific name	Benthic gill nets	Fyke nets	Total
Pike	*Esox lucius*	3	1	4
Roach	*Rutilus rutilus*	302	0	302
Perch	*Perca fluviatilis*	296	4	300
Eel	*Anguilla anguilla*	0	1	1

Fig 9. Number of each species captured by each gear type during the survey of Enagh Lough East, 2016.

4.2 FISH ABUNDANCE

Fish abundance, mean catch per unit effort (CPUE) was calculated as the mean number of fish caught per metre of net. Fish biomass, mean biomass per unit effort (BPUE) was calculated as the mean weight of fish caught per metre of net. For all fish species with the exception of eels CPUE/BPUE is based on all nets including fyke nets. For all eels CPUE/BPUE is based on fyke nets only. Weights were not available from those fish which were released alive. In such cases weights were calculated from the length weight relationship of recorded fish. A summary of CPUE and BPUE data for each species is shown in Figure 10.

Roach were the dominant fish species in terms of abundance although they were only very marginally more abundant than Perch. Perch were by far the dominant species in term of biomass.

Common name	Scientific name	2016 CPUE	2016 BPUE
Pike	*Esox lucius*	**0.012** (0.005)	**2.87** (1.407)
Roach	*Rutilus rutilus*	**0.915** (0.489)	**9.929** (3.894)
Perch	*Perca fluviatilis*	**0.909** (0.401)	**17.055** (6.557)
Eel	*Anguilla anguilla*	**0.011** (0.011)	**8.001** (8.001)

Fig 10. Mean (± S.E.) CPUE and BPUE for all fish species recorded on Enagh Lough East, 2016.

Fig 11. Gill net being hauled on Enagh Lough East, 2016.

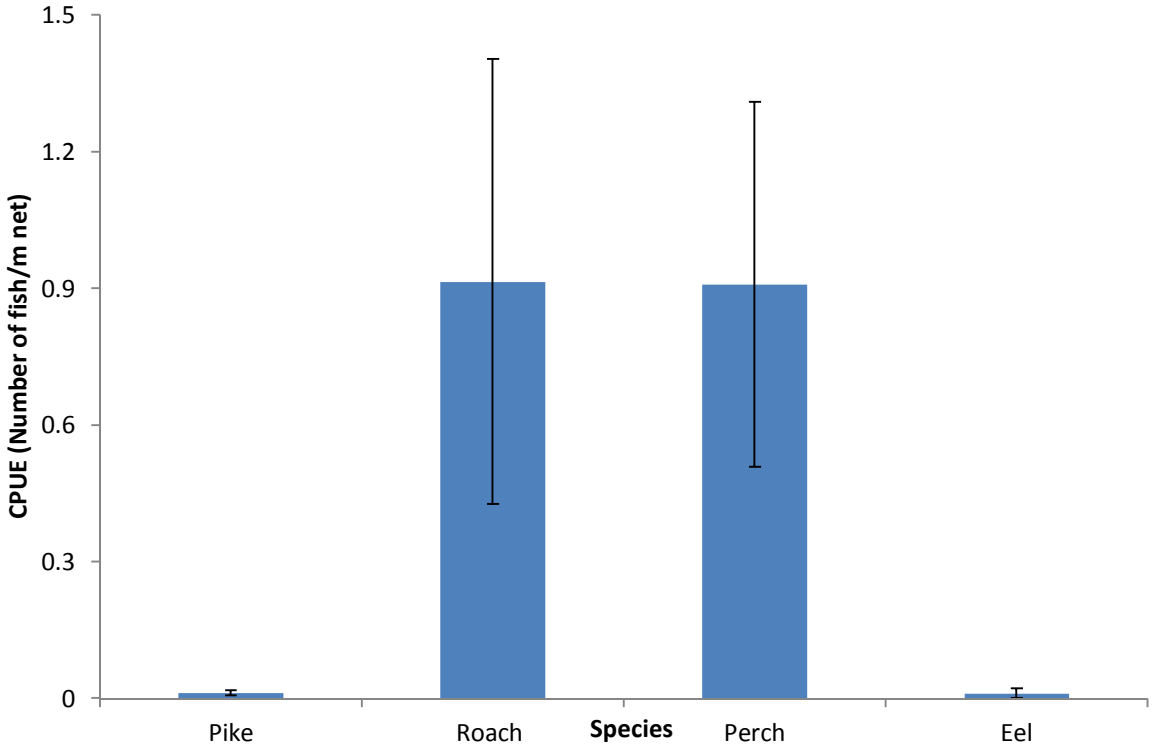

Fig 12. Mean (± S.E.) CPUE for all fish species captured in Enagh Lough East 2016 (Eel CPUE based on Fyke nets only).

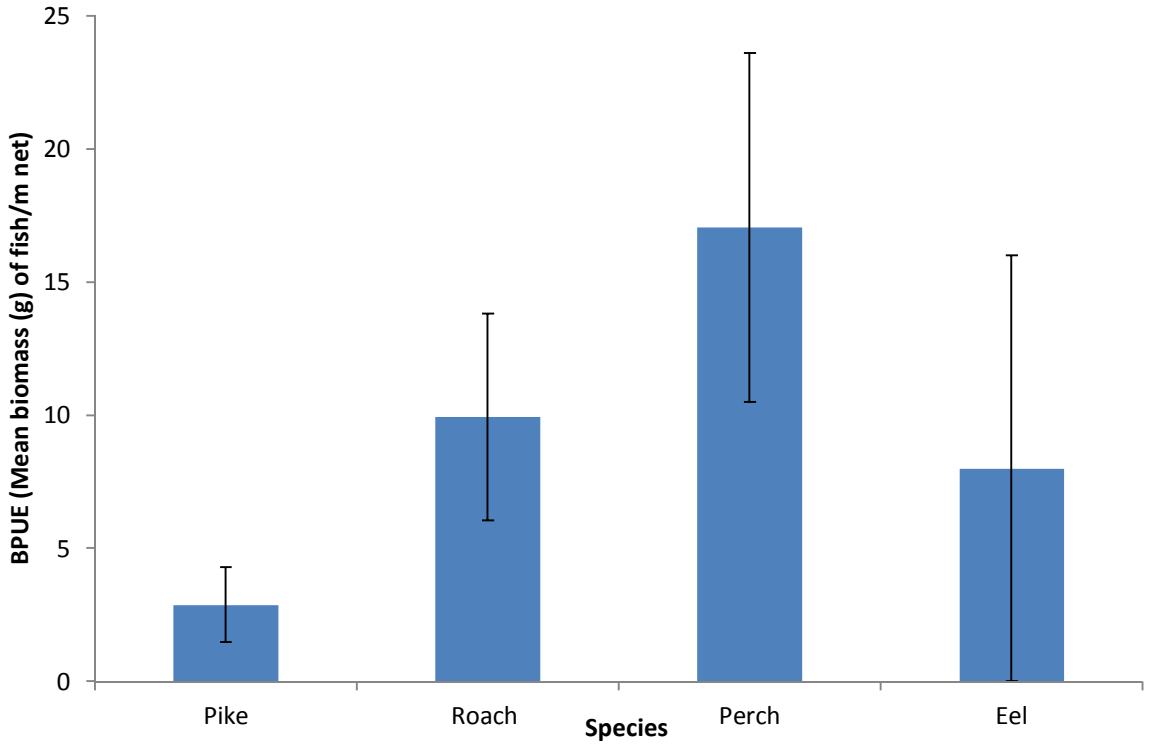

Fig 13. Mean (± S.E.) BPUE for all fish species captured in Enagh Lough East 2016 (Eel BPUE based on Fyke nets only).

4.3 PIKE STOCK DENSITY & POPULATION STRUCTURE

The relative density (CPUE & BPUE) and length frequency distribution of Pike is presented below. Values are also compared with other lakes which have been surveyed within the Foyle and Carlingford areas. A total of 4 Pike were recorded during the Enagh Lough East survey, lengths ranged from 190mm to 371mm (mean length 313mm). The abundance of Pike in Enagh Lough East is slightly less than other surveyed loughs. 9 Pike were recorded in Lough Mourne 2010, lengths ranged from 195mm to 316mm (mean length 279mm). 6 Pike were recorded in Lough Muck 2011 (Tyrone), lengths ranged from 365mm to 610mm (mean length 464mm). 2 Pike were recorded in Camlough 2016, lengths ranged from 593mm to 602mm (mean length 598mm).

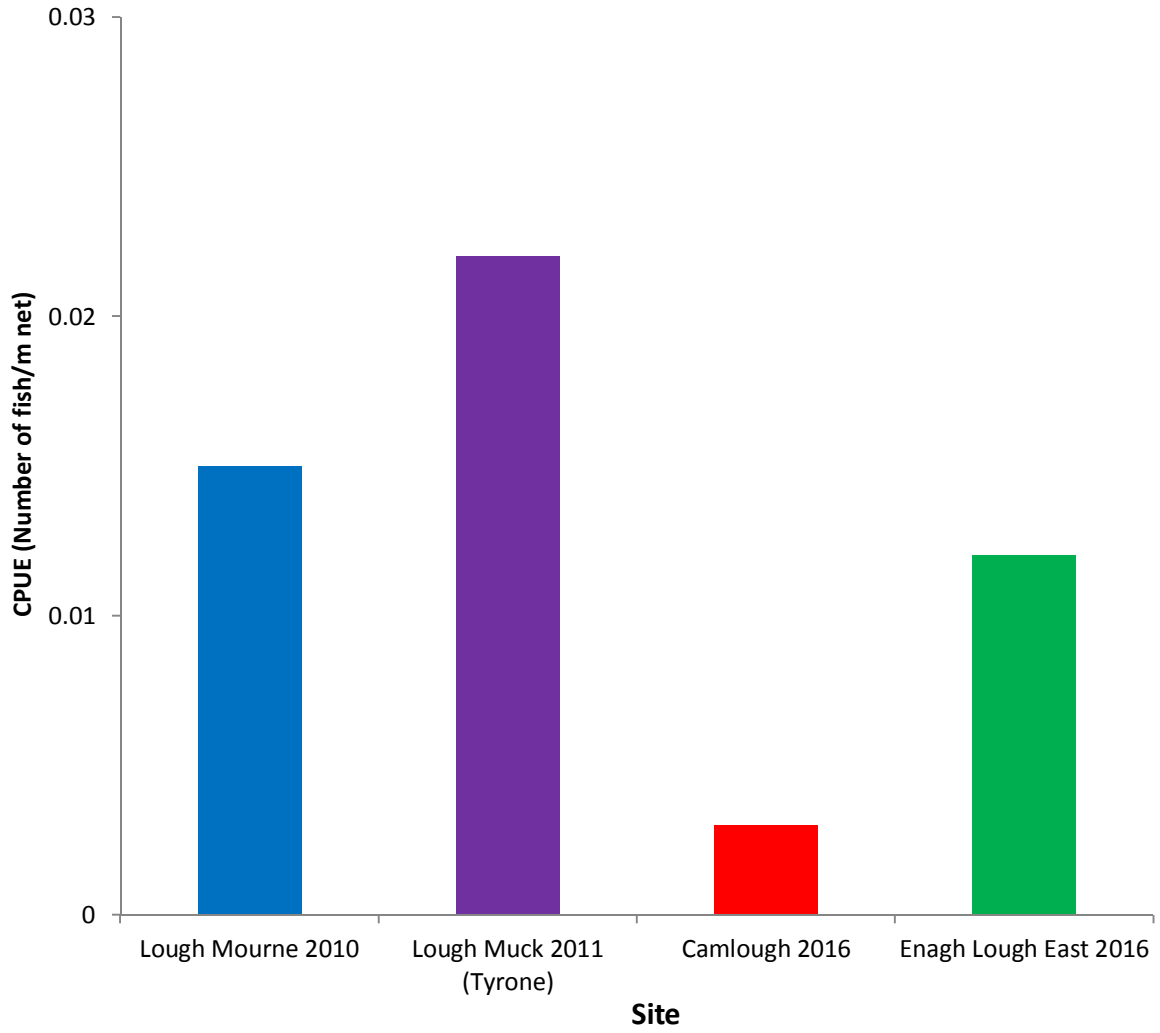

Fig 14. Mean CPUE for all Pike captured in Lough Mourne 2010, Lough Muck 2011, Camlough 2016 and Enagh Lough East 2016.

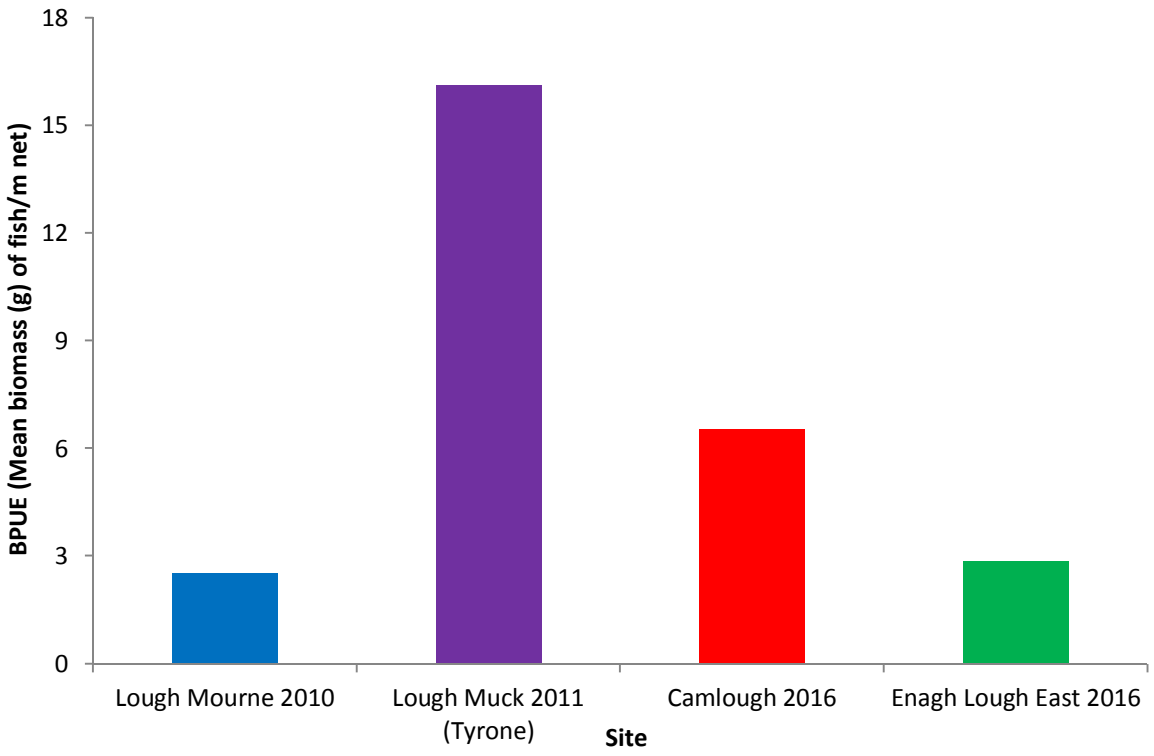

Fig 15. Mean BPUE for all Pike captured in Lough Mourne 2010, Lough Muck 2011, Camlough 2016 and Enagh Lough East 2016.

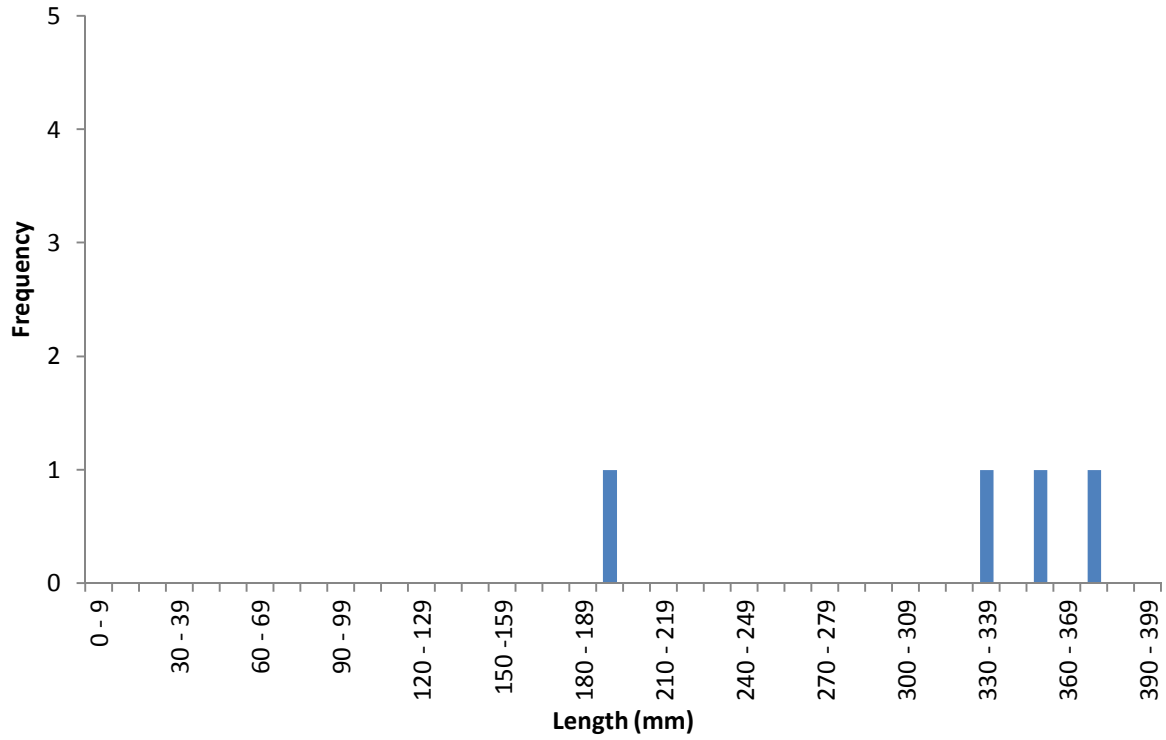

Fig 16. Length frequency Pike, Enagh Lough East 2016 (N=4).

4.4 ROACH STOCK DENSITY & POPULATION STRUCTURE

The relative density (CPUE & BPUE) and length frequency distribution of Roach is presented below. Values are also compared with other lakes which have been surveyed within the Foyle and Carlingford areas. A total of 302 Roach were recorded in Enagh Lough East, lengths ranged from 50mm to 291mm (mean length 86mm). The abundance of Roach in Enagh Lough East compares favourably with other surveyed loughs although in terms of biomass these fish tend to be smaller in comparison. 208 Roach were recorded in Lough Mourne 2010, lengths ranged from 50mm to 280mm (mean length 126mm). 96 Roach were recorded in Lough Muck 2011, lengths ranged from 110mm to 260mm (mean length 176mm). 605 Roach were recorded in Camlough 2016, lengths ranged from 58mm to 294mm (mean length 99mm).

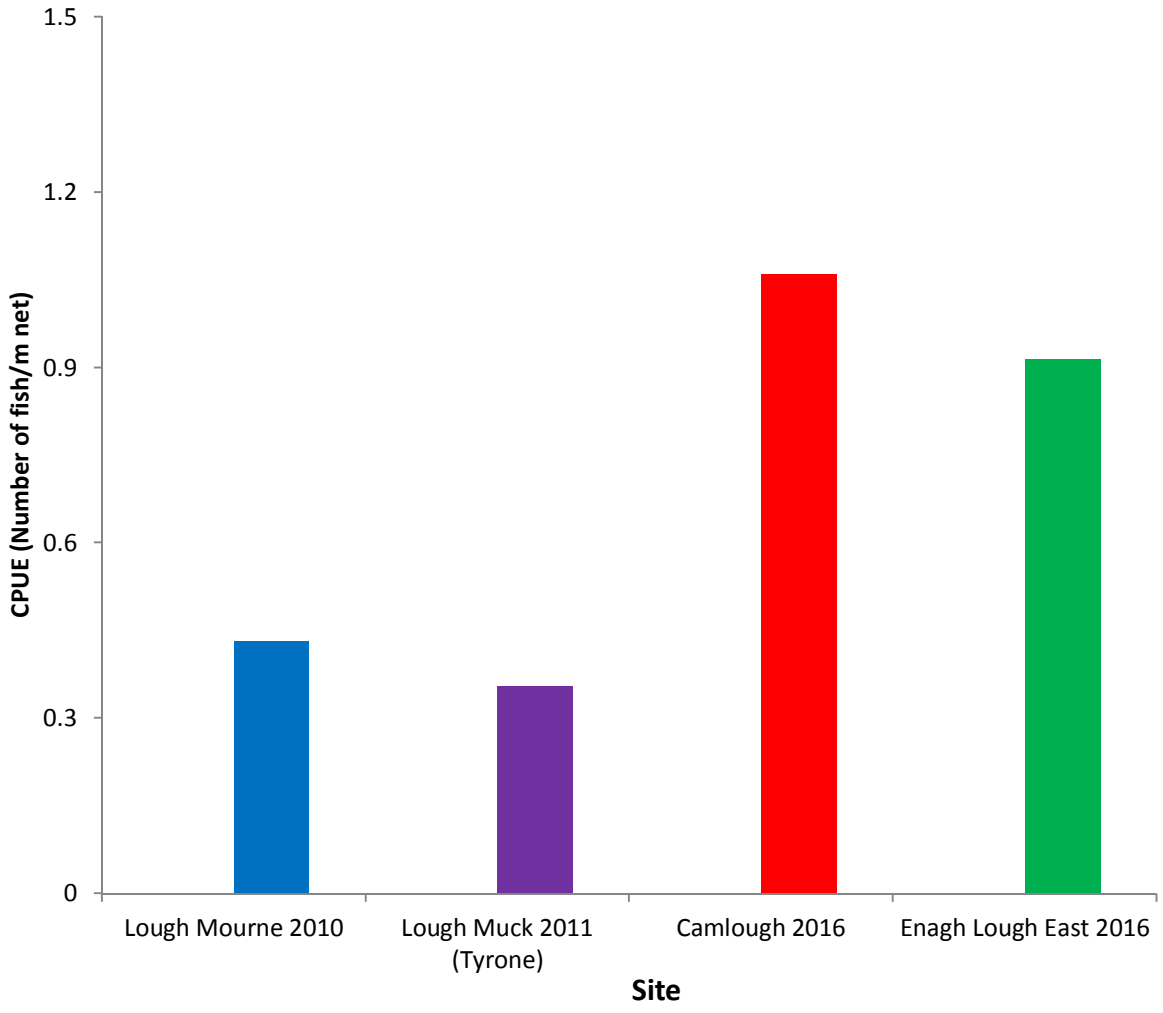

Fig 17. Mean CPUE for all Roach captured in Lough Mourne 2010, Lough Muck 2011, Camlough 2016 and Enagh Lough East 2016.

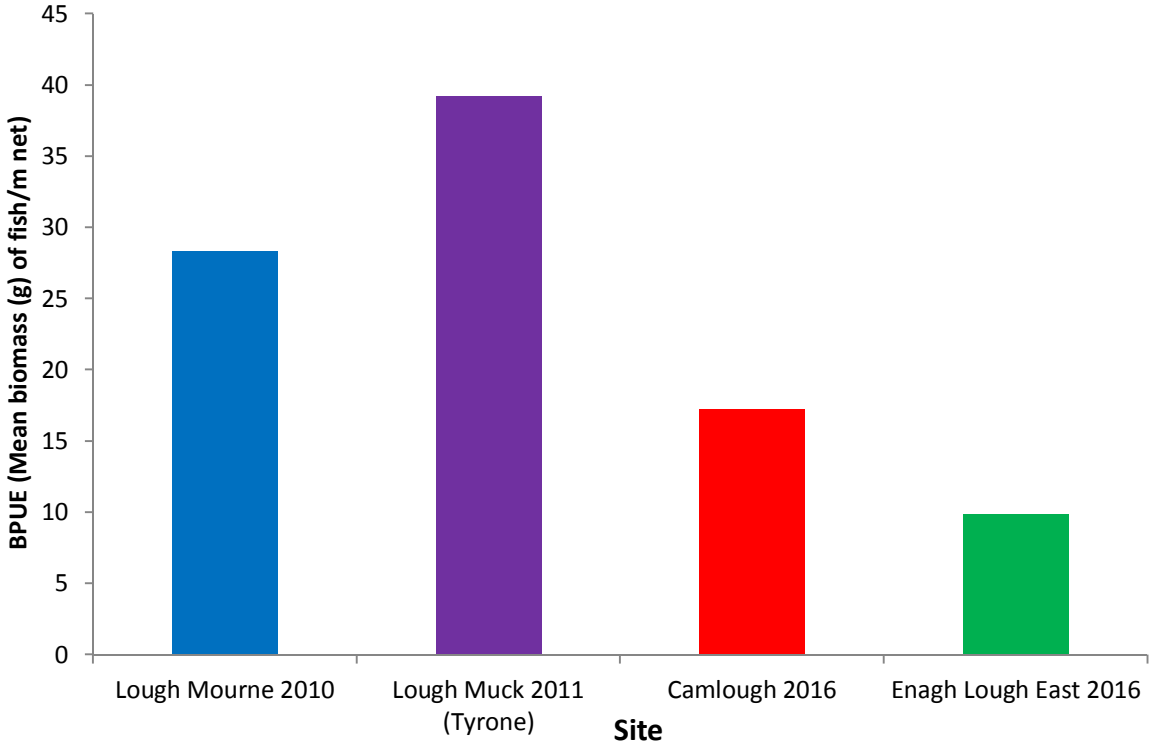

Fig 18. Mean BPUE for all Roach captured in Lough Mourne 2010, Lough Muck 2011, Camlough 2016 and Enagh Lough East 2016.

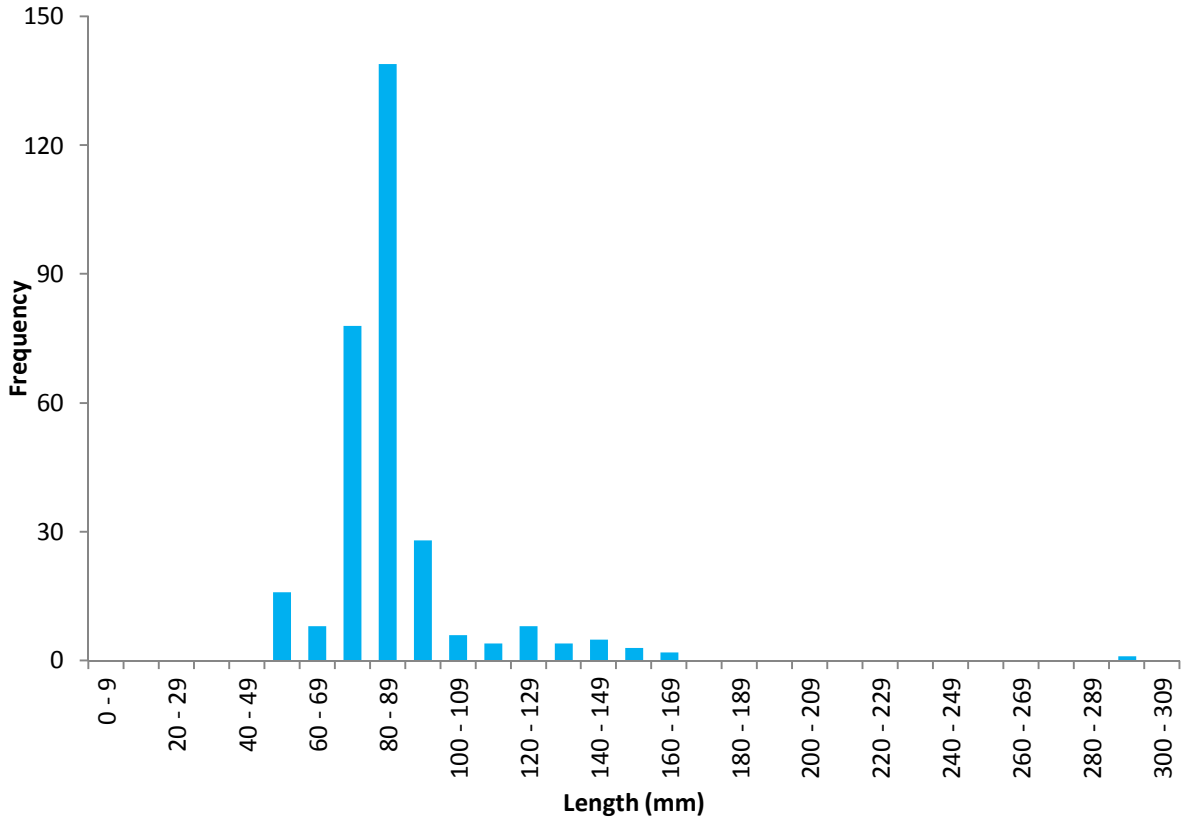

Fig 19. Length frequency Roach, Enagh Lough East 2016 (N=302)

4.5 PERCH STOCK DENSITY & POPULATION STRUCTURE

The relative density (CPUE & BPUE) and length frequency distribution of Perch is presented below. Values are also compared with other lakes which have been surveyed within the Foyle and Carlingford areas. A total of 300 Perch were recorded in Enagh Lough East in 2016, lengths ranged from 50mm to 287mm (mean length 88mm). The abundance of Perch in Enagh Lough East is slightly higher than other surveyed loughs and the biomass of fish caught is almost identical in comparison. 194 Perch were recorded in Lough Muck 2011, lengths ranged from 43mm to 330mm (mean length 113mm). 417 Perch were recorded in Camlough, lengths ranged from 56mm to 255mm (mean length 110mm).

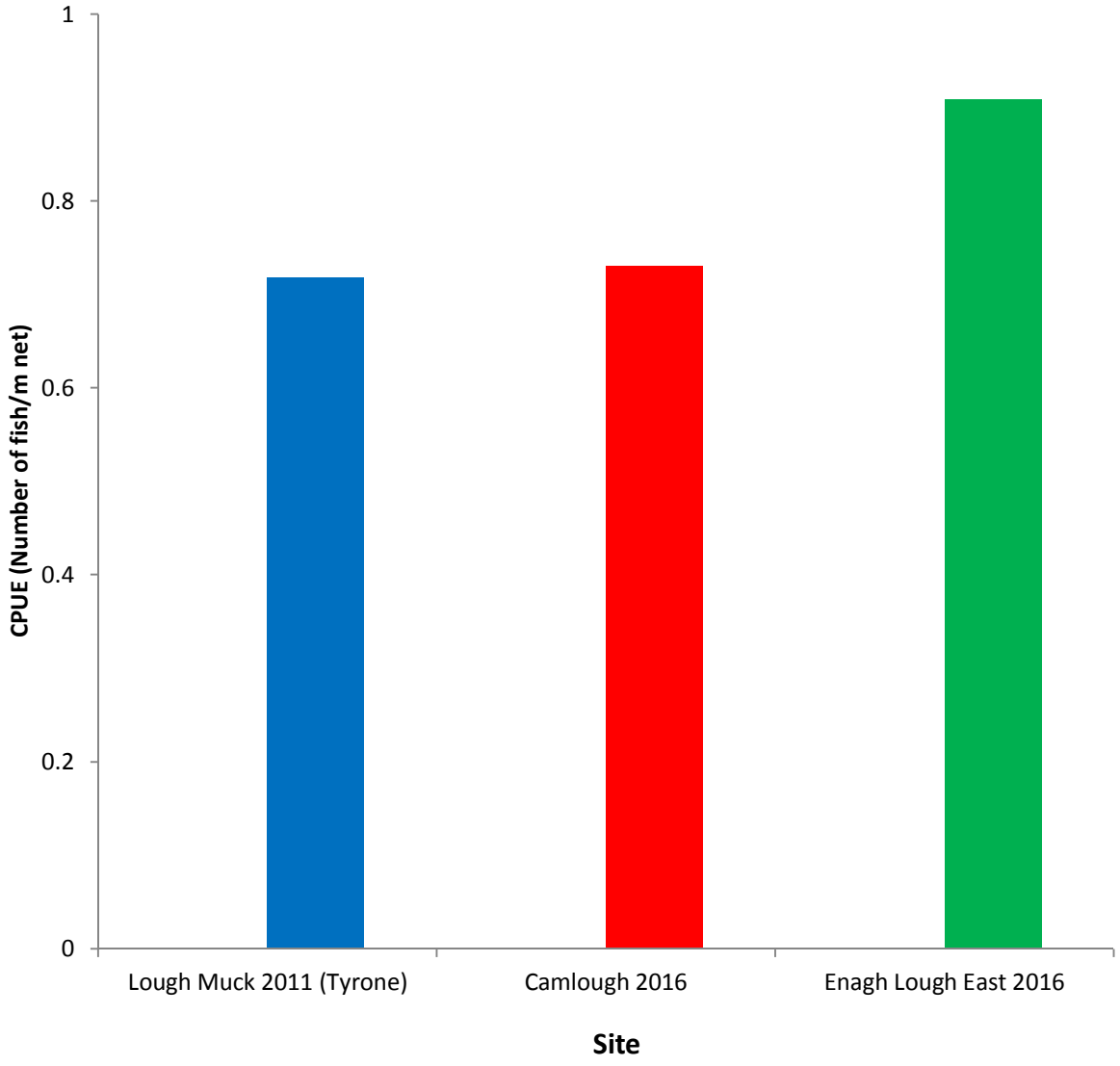

Fig 20. Mean CPUE for all Perch captured in Lough Muck 2011, Camlough 2016 and Enagh Lough East 2016.

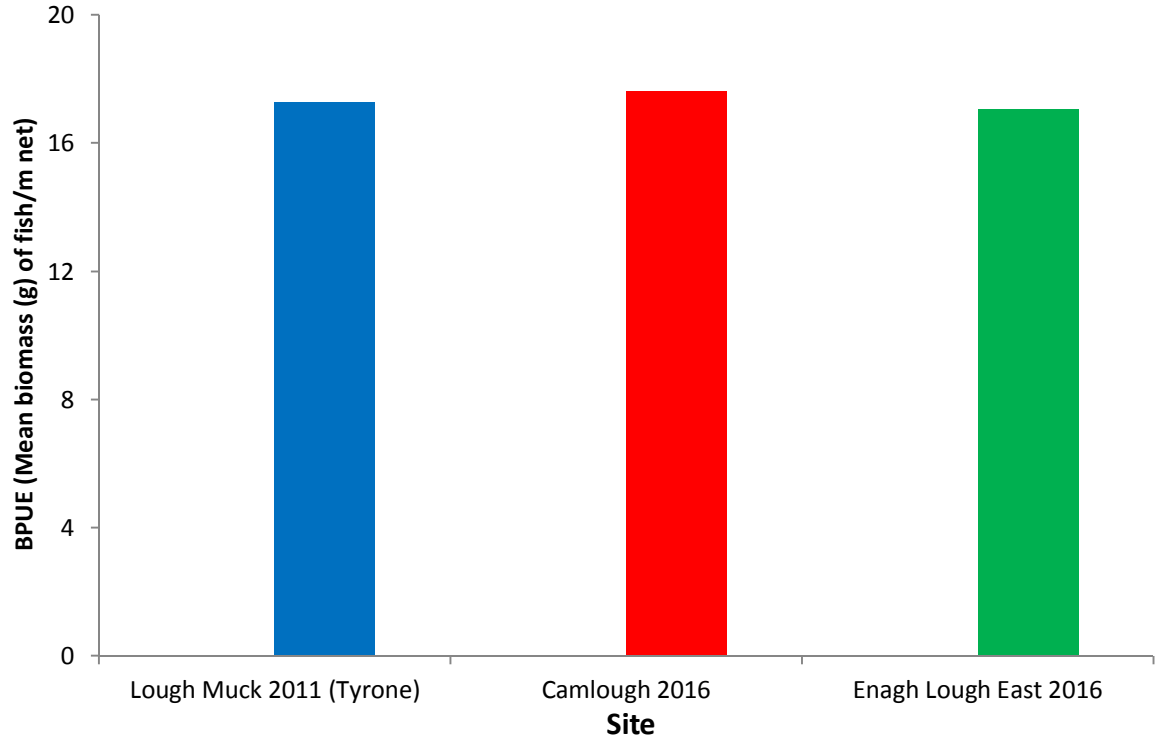

Fig 21. Mean BPUE for all Perch captured in Lough Muck 2011, Camlough 2016 and Enagh Lough East 2016.

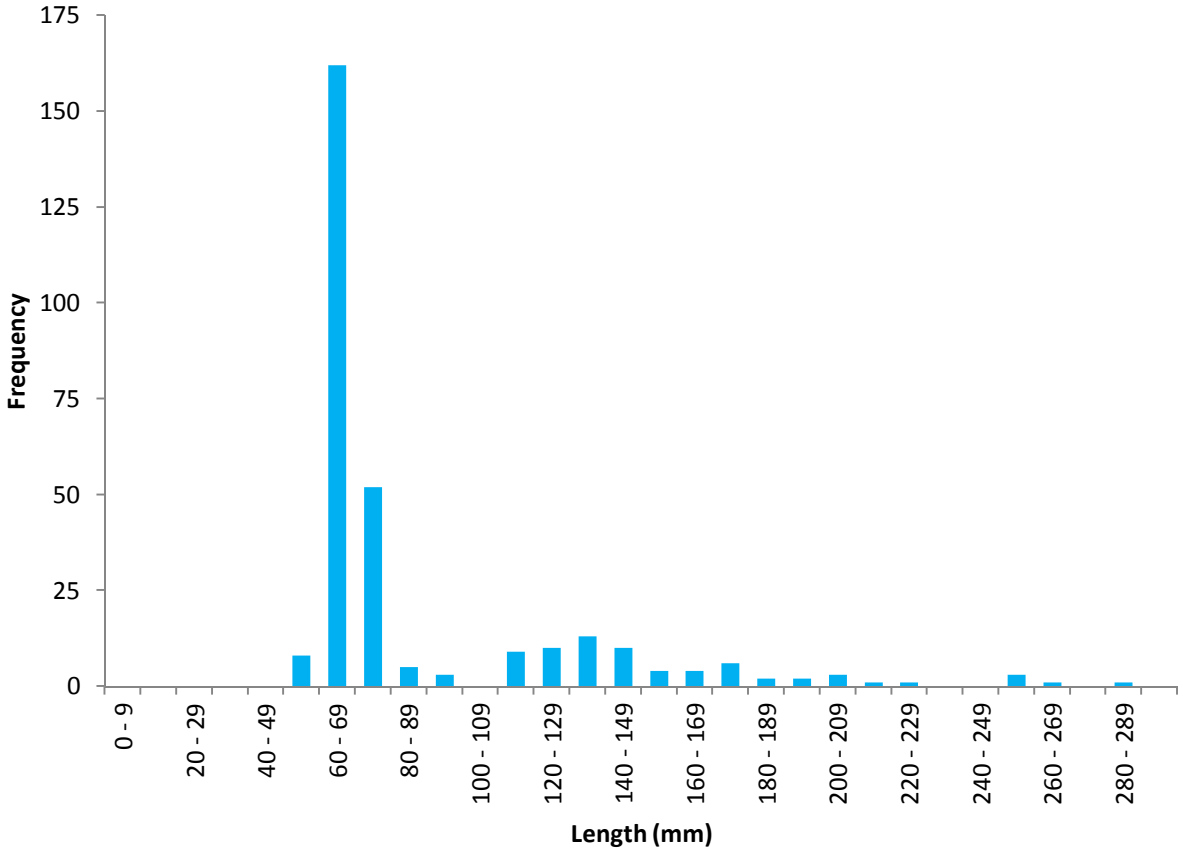

Fig 22. Length frequency Perch, Enagh Lough East 2016 (N=300).

4.6 EEL STOCK DENSITY & POPULATION STRUCTURE

The relative density (CPUE & BPUE) and length frequency distribution of Eels is presented below. A total of 1 Eel was recorded in Enagh Lough East, which measured 529mm and weighed 720 grams. Eel data from other lakes which have been surveyed within the Foyle and Carlingford areas is also presented below.

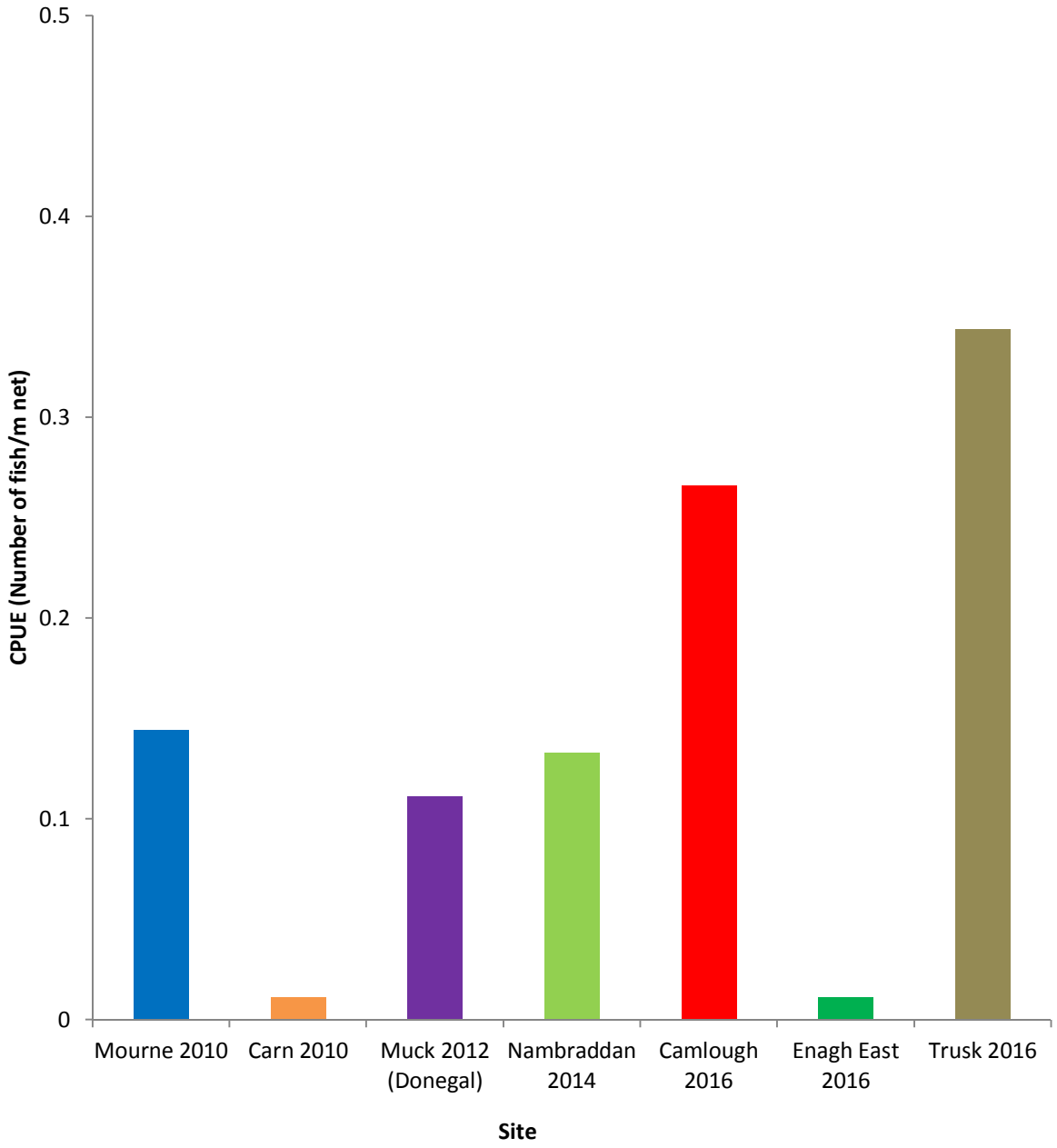

Fig 23. Mean CPUE for all Eels captured in Lough Mourne 2010, Lough Carn 2010, Lough Muck 2012, Lough Nambraddan 2014, Camlough 2016, Enagh East 2016 and Lough Trusk 2016.

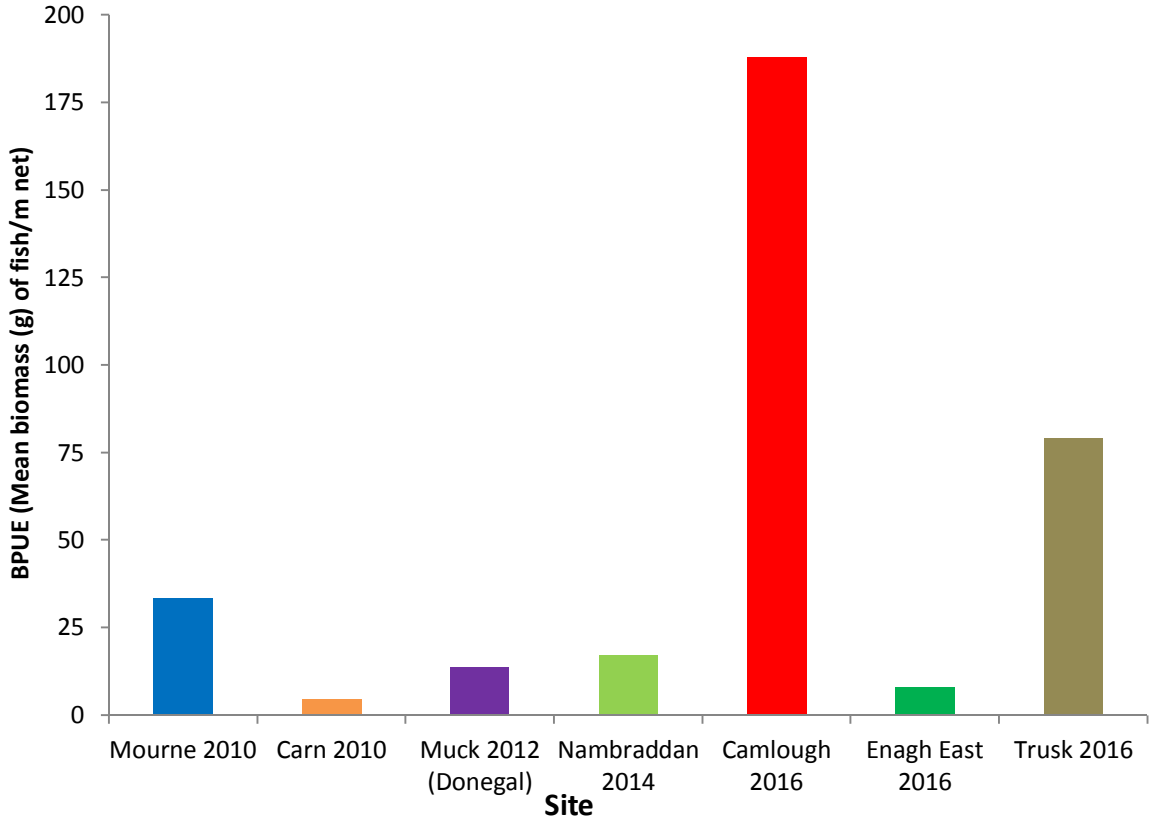

Fig 24. Mean BPUE for all Eels captured in Lough Mourne 2010, Lough Carn 2010, Lough Muck 2012, Lough Nambraddan 2014, Camlough 2016, Enagh East 2016 and Lough Trusk 2016.

Lake	Number of Eels	Mean Length	Mean Weight
Lough Mourne 2010	*13*	465 mm	231 g
Lough Carn 2010	*1*	605 mm	420 g
Lough Muck 2012 *(Donegal)*	*10*	380 mm	123 g
Nambraddan 2014	*12*	409 mm	130 g
Camlough 2016	*25*	529 mm	764 g
Enagh Lough East 2016	*1*	529 mm	720 g
Trusk Lough 2016	*31*	442 mm	230 g

Fig 25. Eel mean length and mean weight comparison for lakes surveyed 2010 – 2016.

4.7 FISH AGE AND GROWTH

Scales were taken from 35 Roach caught during this survey for fish aging and back calculated growth analysis. Figure 28 below outlines the average length at age for Roach caught during the survey and compares them to Roach caught in Camlough the same year. A range of age classes were present in Enagh Lough East with the oldest Roach found to be in the 9+ age class. Opercula were also taken from 46 Perch for fish aging and back calculated growth curves. Figure 29 outlines the average length at age for Perch caught during the survey and compares them to Perch caught in Camlough the same year. A range of age classes were present in Enagh Lough East with the oldest Perch found to be in the 6+ age class. Due to time restraints there was no fish aging carried out on Pike or Eels during this survey.

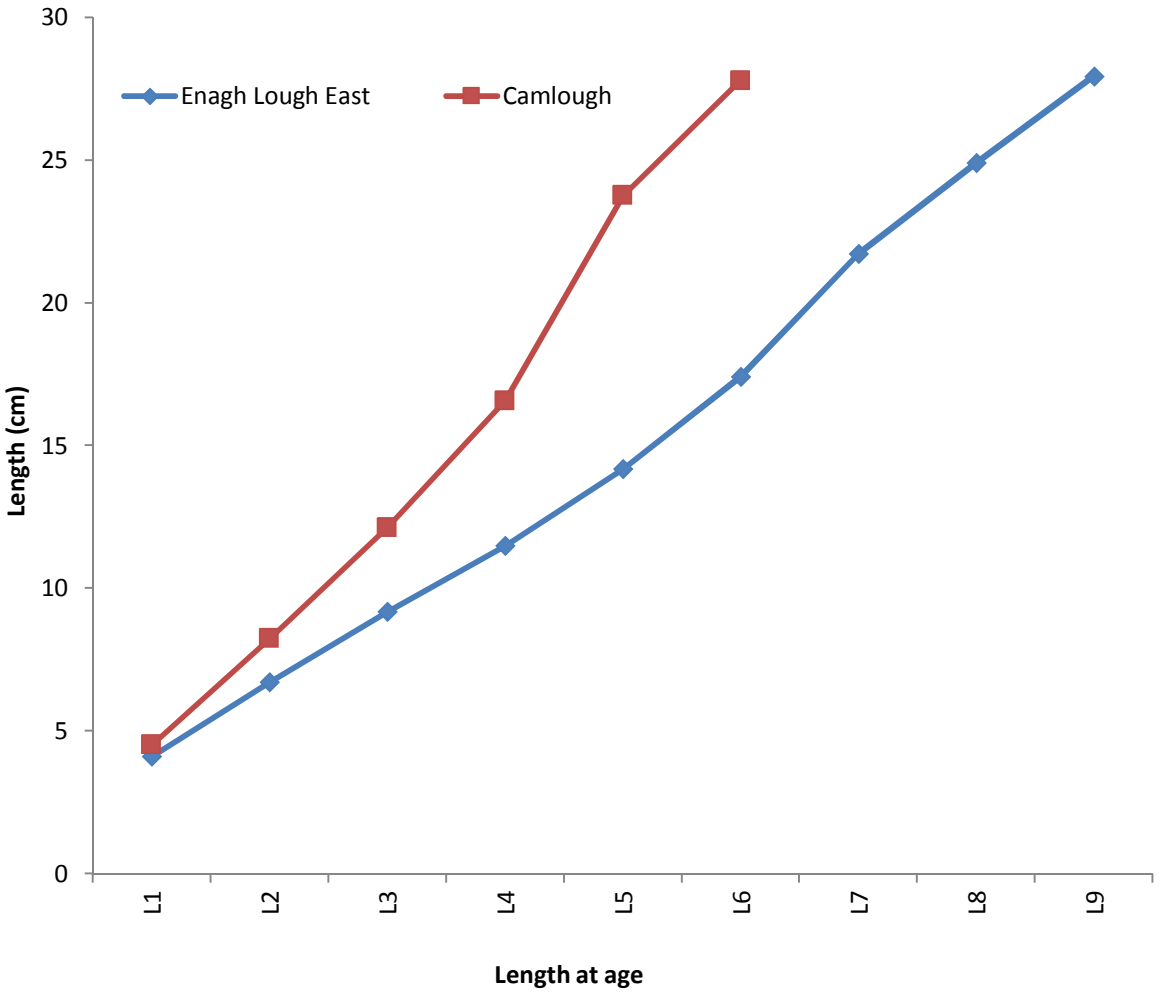

Fig 26. Comparison growth curve showing back calculated length at age for Roach, Enagh Lough East and Camlough 2016.

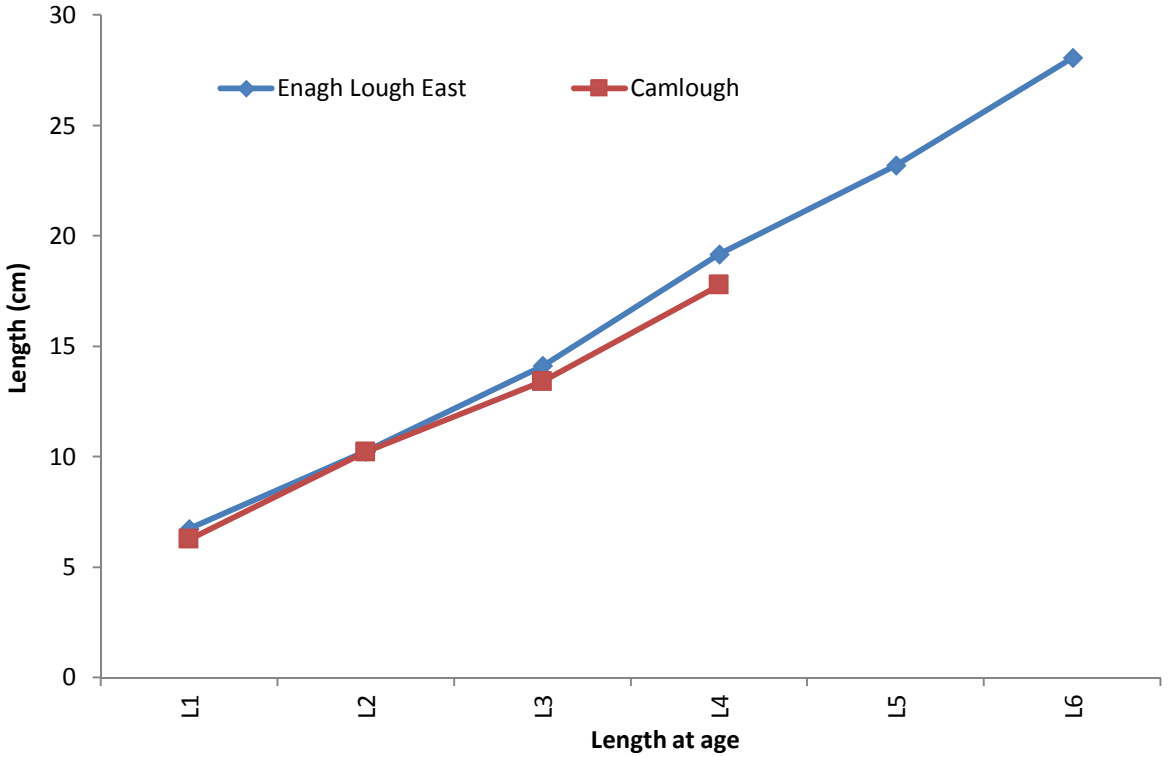

Fig 27. Comparison growth curve showing back calculated length at age for Perch, Enagh Lough East and Camlough 2016.

5.0 DISCUSSION

This lake fish survey of Enagh Lough East was the first undertaken by the Loughs Agency Freshwater Fisheries Monitoring Team. Roach were found to be the dominant species in the lough, however only very marginally as the abundance of Perch was almost identical. Although the populations of both Roach and Perch are very similar in number, the Perch population generally consists of larger fish contributing to a greater biomass of Perch stocks. The nearby Enagh Lough West has an established Pike fishery although a total of only 4 Pike were caught during this survey. Pike however are thought to utilise deeper habitats and become more sedentary during the summer months, making capture less likely. Only 1 Eel was captured during the survey indicative of very low abundance and biomass when compared with other lakes surveyed in the Foyle and Carlingford areas since 2010. In this case it may be due to connectivity issues with the neighbouring River Faughan.

This report is a baseline scientific survey of fish stocks in Enagh Lough East and it is hoped that it can provide the basis for an evidence based approach to the future management of the lough. The fishery owners, managers and anglers should also have an opportunity to review this report and consider its recommendations when developing any future angling initiatives for Enagh Lough East.

The information presented in this report can also be used to compare stocks from any other water body where the same survey method has been used.

6.0 INVASIVE SPECIES

Invasive non-native species are those which have been transported outside of their natural range. They are capable of spreading rapidly and colonising a wide range of habitats. They also exhibit competitive dominance by out-competing native flora and fauna for light, oxygen and food. There is growing evidence to suggest that invasive riparian plants are having an adverse effect on aquatic habitats and species by altering both in-stream processes and terrestrial-aquatic linkages. Invasive species threaten native species as direct predators or competitors, as vectors of disease, and by modifying the native habitats. Invasive species are considered the second biggest threat after habitat loss to biodiversity worldwide by the Millennium Ecosystem Assessment in 2005.

Water is an excellent transport medium for the dispersion of many of these species. Rivers and loughs with their banks and shorelines are amongst the most vulnerable areas to their introduction, spread and impact. The focus for the Loughs Agency is predominantly on aquatic and riparian invasive species as these are a serious threat to our sensitive aquatic habitats. The spread of invasive species can also further threaten already endangered native species. In freshwater habitats the introduction of invasive species is considered the second leading cause of species extinctions. Invasive species are a global problem and once they are established eradication is often costly and extremely difficult. Previous studies suggest that early intervention is a more successful and cost-effective way of preventing the spread of invasive species.

There are a multitude of invasive non-native species across the UK and Ireland at present, many of them with the potential to cause serious environmental harm. Three species in particular, Japanese Knotweed (*Fallopia japonica*), Himalayan Balsam (*Impatiens grandulifera*) and Giant Hogweed (*Heracleum mantegazzianum*) have become an established threat to the streams and rivers of the Foyle and Carlingford areas. Rivers are an excellent means of transporting, dispersing and spreading invasive species, therefore it is no great surprise to see a proliferation along our river corridors.

There is a growing body of evidence demonstrating the damaging impacts of (INNS) invasive non-native species. The problem of excessive soil erosion along the riparian zone can have grave consequences for freshwater fish species. Atlantic salmon (Salmo salar) and Trout (Salmo trutta) are reliant upon finding appropriately sized spawning gravel to complete their life cycle. However, Himalayan Balsam will die back in winter time, leaving behind exposed river banks devoid of any natural vegetation. The lack of vegetation on the riparian zone leaves the bank highly susceptible to soil erosion at times of increases flows and floods. Excessive soil erosion will increase the sediment load into the stream reach and can potentially smother the eggs buried in the spawning gravel, starving them of oxygen. Atlantic salmon stocks are at unprecedented low levels and they are also experiencing very high mortality rates during the marine phase of their life cycle. Increased sediment being introduced to rivers and streams has the potential to diminish juvenile abundance even further and merely exacerbates the problem still further.

7.0 BIOSECURITY

Invasive species are an ever present threat in our aquatic and riparian systems and it is imperative that none of our field operations exacerbate the risks to the environment and to the economy that are posed by these species. Fish parasites, pathogens and diseases also represent a significant threat to the health status of our watercourses. The introduction or transfer of such pathogens or diseases has the potential to wipe out large populations of fish in affected waters or catchments. Loughs Agency staff are required to be vigilant to help prevent the spread of fish diseases and invasive species. The agency has incorporated biosecurity protocols into its freshwater fisheries monitoring programme and

these guidelines are also adhered to by fishery officers and field staff alike. The Loughs Agency biosecurity protocol for field operations was fully implemented during the Enagh Lough East fish survey.

8.0 RECOMMENDATIONS

- Repeat survey every 5 years.
- Compare results against any future surveys in the Foyle area to ascertain comparative growth rates across and within a range of stillwaters of the Foyle and Carlingford areas.
- Communicate findings internally to colleagues and externally to stakeholders
- Continue to conduct stillwater fish surveys temporally and spatially within the Foyle and Carlingford areas.
- Promote Biosecurity awareness with angling community

9.0 REFERENCES

Kelly, FL (2008) WFD Surveillance Monitoring Fish in Lakes (2007) Central and Regional Fisheries Board report.

Kelly, F.L., Connor, L., Wightman, G., Matson, R., Morrissey, E O'Callaghan, R., Feeney, R., Hanna, G. and Rocks, K., (2009) Sampling fish for the Water Framework Directive – Summary Report 2008. Central and Regional Fisheries Board report.

North South Share Aquatic Resource (NS Share). Methods Manual V Fish (2008)

European CEN Standard. Water quality-Sampling of fish with multi-mesh gill nets (2005).