LOUGHS AGENCY OF THE FOYLE CARLINGFORD AND IRISH LIGHTS COMMISSION

Stillwater Status Report: Camlough, Co. Armagh

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 Camlough, Co. Armagh during the summer of 2016.

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EXECUTIVE SUMMARY

A Water Framework Directive compliant stillwater fish stock assessment was carried out on Camlough, Co. Armagh in June 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 for many purposes ranging from formal Water Framework Directive classification, a baseline survey for use in the scrutiny of any future development proposals and for contributing towards the sustainable development of the angling amenity.

Camlough is a large disused reservoir which historically had powered spinning and flax mills in Bessbrook, provided water for the Newry Canal and made up part of the domestic water supply for Newry City. Today it is an important recreational resource for water based activities including waterskiing, swimming, triathlon and coarse fishing. The lough has an established coarse fishery targeting pike, bream, roach and perch. Camlough was selected as no previous baseline scientific fisheries survey had been conducted on the lough.

The 2016 fish stock assessment noted the presence of several fish species in Camlough including Pike, Bream, European eel, Roach, Perch and some Roach/Bream hybrids with a total of 1288 individual fish captured during the survey. Roach *(Rutilus rutilus)* were the most common fish species encountered.

This is the first lake survey report on Camlough and provides a baseline survey of species and their relative abundance to fishery managers and anglers. It is anticipated that this survey report could significantly contribute towards any future sustainable development of angling initiatives, infrastructure or development plans for Camlough by providing the basis for an evidence based approach to the fisheries 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 Camlough and provided to the Northern Ireland Environment Agency for reporting purposes.

1.0 INTRODUCTION

Camlough is located approximately 5km west of Newry City, Co. Down in the Bessbrook/Camlough River catchment. The lake is located at an altitude of approximately 100 metres above sea level and its principal dimensions are;

- Length: 2.7km long, maximum width 480 metres
- Surface area: 71 hectares
- Maximum depth: 19 metres

Fig.1 Stillwater Fish Survey being carried out on Camlough Lake, 2016.

At the time of survey Camlough had been significantly dewatered to facilitate major repair works to the impounding structure (Dam) at the outflow. Water levels were approximately 10m lower than those that would normally be expected.

2.0 METHODS

Camlough was surveyed over one night on the 23rd of June 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). Prior to the commencement of the fish survey, accurate depth data and lake area (ha) were both used to calculate the number and distribution of benthic multi-mesh gill nets required to carry out the survey (CEN standard 2005). A total of 19 nets were set in Camlough, as summarised in Table 1.

Fig 2. Camlough lake fish survey in progress and Camlough

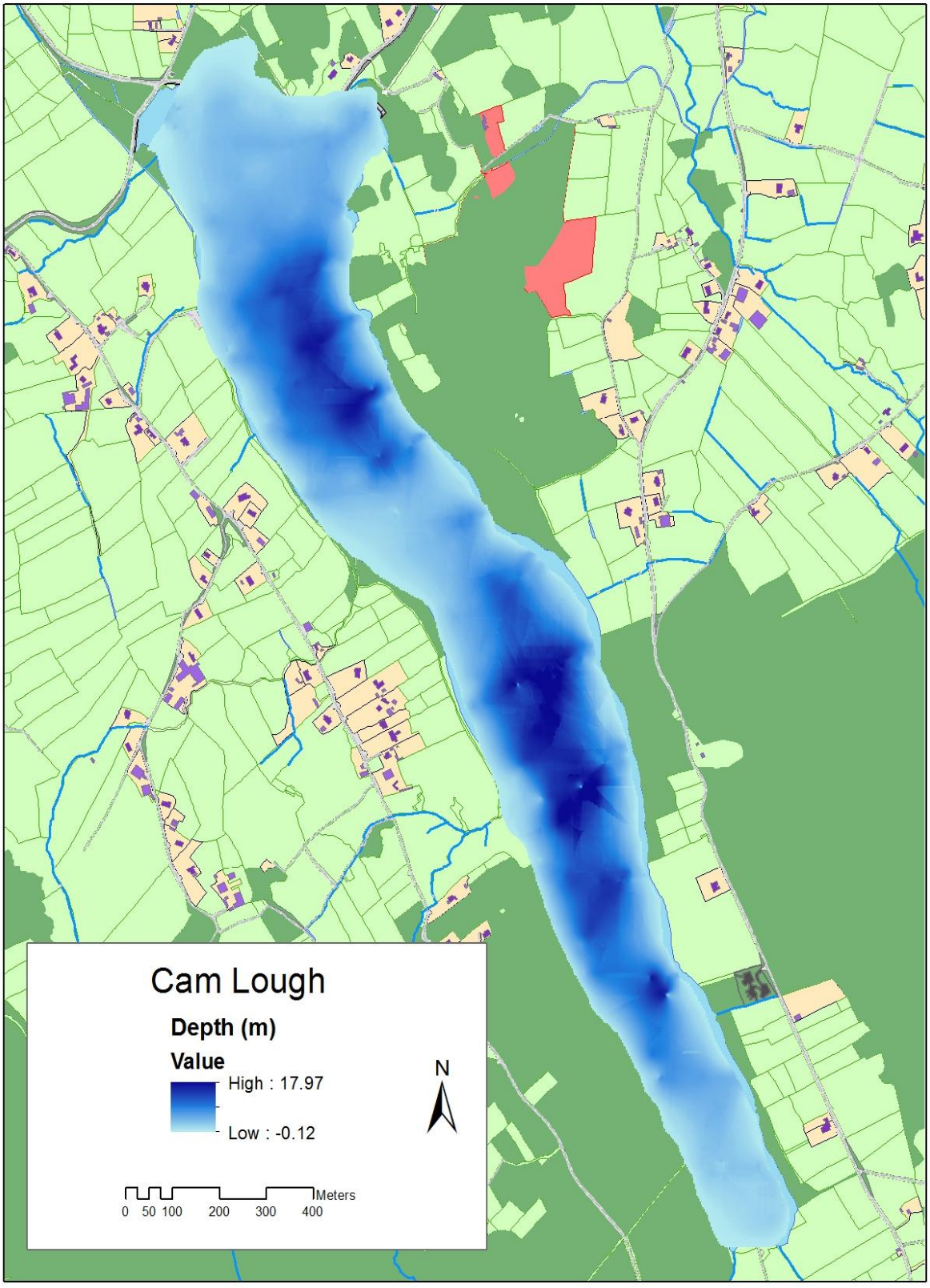

Fig 3. Bathymetric map of Camlough.

Net type	No. Deployed	Water depth (m)
Dutch fyke nets (chain of 3)	3	0 – 2.9
Multi-mesh gill nets	4	0 – 2.9
Multi-mesh gill nets	4	3 – 5.9
Multi-mesh gill nets	2	6 – 11.9
Multi-mesh gill nets	2	12 – 19.9
Multi-mesh floating nets	4	12 – 19.9

Table 1. Details of survey nets deployed.

Survey locations were chosen within randomly selected 50m X 50m grid squares overlaid on a bathymetric map of the lough. The location and bathymetry of each net is shown (Figure 5). A handheld Trimble Geo HT GPS was used to record the precise location of each net (Figure 6). Any fish which were alive and in good condition were measured and released alive 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 in Prehen.

Fig 4. Loughs Agency survey boat deployed for survey on Camlough, June 2016.

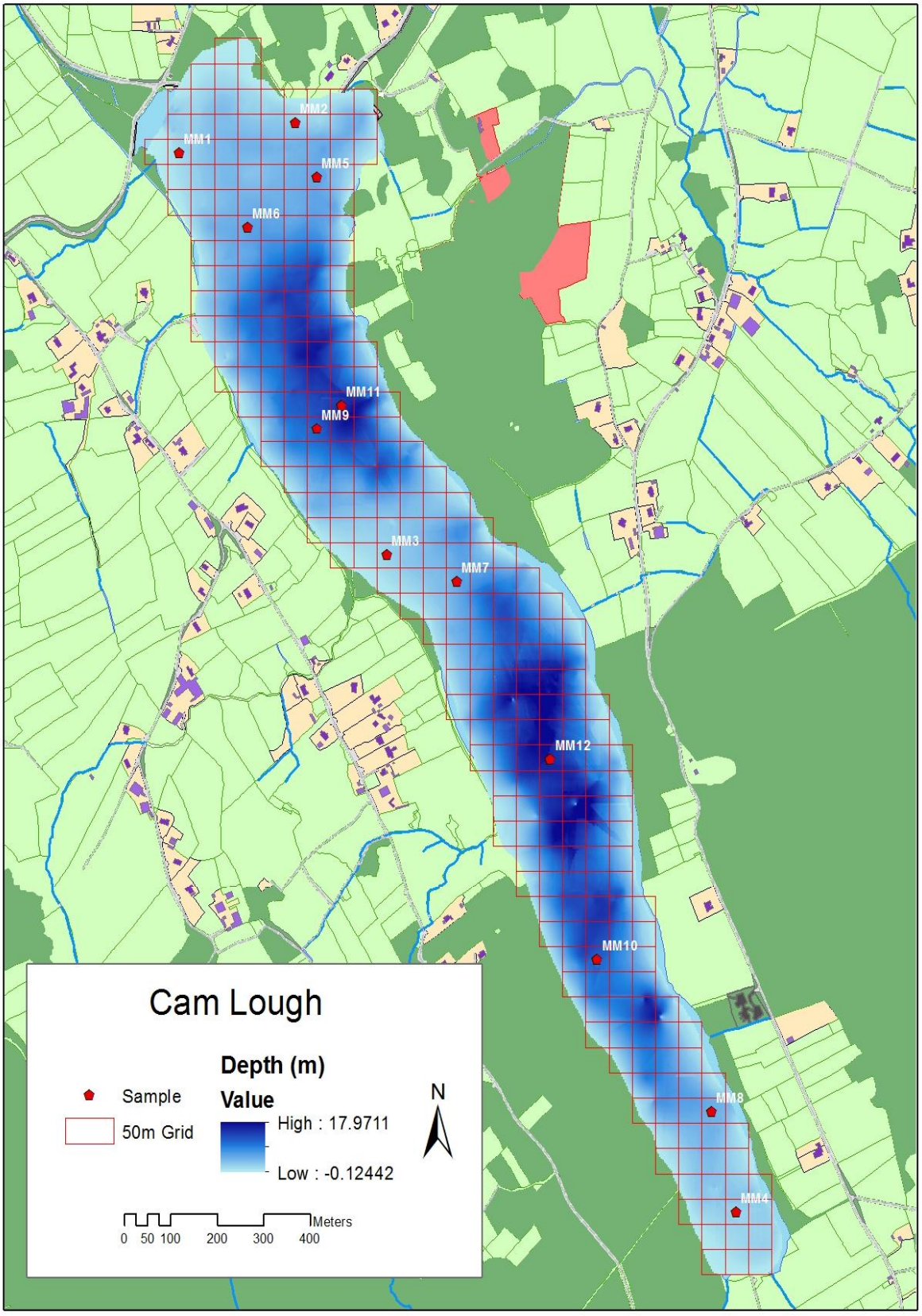

Fig 5. Camlough net locations overlaid on randomly selected 50 metre grids within defined bathymetry zones.

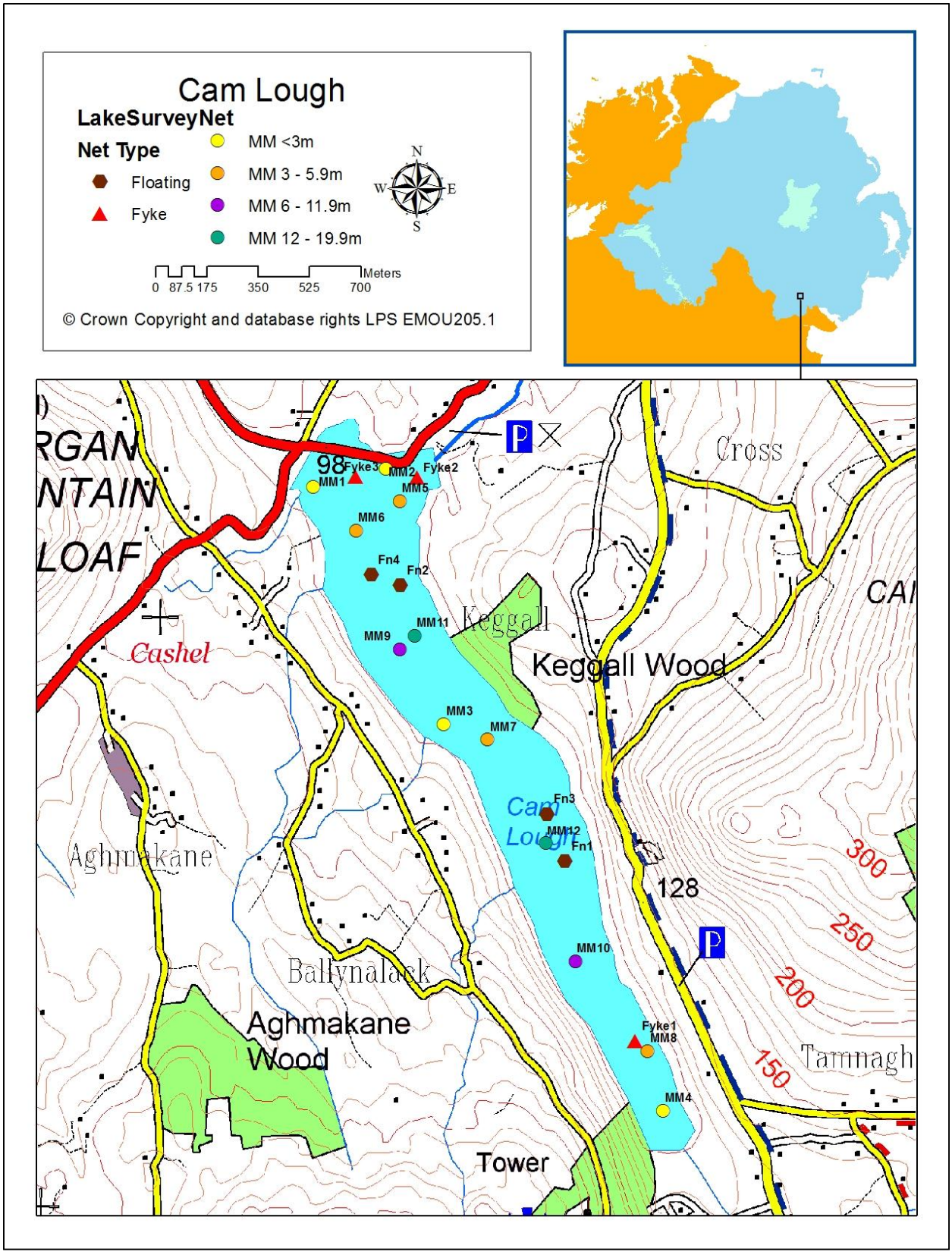

Fig 6. Map of Camlough detailing net locations and net type.

3.0 RESULTS

3.1 SPECIES RICHNESS

A total of six fish species were recorded on Camlough in June 2016 with a total of 1288 fish captured during the survey. A list of species encountered and captured by each gear type is presented in Figure 7. Roach *(Rutilus rutilus)* were the most common fish species encountered in the benthic gill nets. All eels apart from one, were captured in the fyke nets. A total of 62 Roach X Bream hybrids were also captured.

Common name	Scientific name	Benthic gill nets	Fyke nets	Total
Pike	*Esox lucius*	2	0	2
Bream	*Abramis brama*	177	0	177
Roach	*Rutilus rutilus*	604	1	605
Perch	*Perca fluviatilis*	415	2	417
Eel	*Anguilla anguilla*	1	24	25
Roach/Bream Hybrids	*Rutilus rutilus X Abramis brama*	62	0	62

Fig 7. Number of each species captured by each gear type during the survey of Camlough, 2016.

3.2 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 8.

Roach were the dominant fish species in terms of abundance and eels were the dominant species in term of biomass.

Common name	Scientific name	2016 CPUE	2016 BPUE
Pike	*Esox lucius*	**0.003** (0.002)	**6.546** (4.499)
Bream	*Abramis brama*	**0.31** (0.082)	**73.635** (14.207)
Roach	*Rutilus rutilus*	**1.061** (0.302)	**17.27** (4.45)
Perch	*Perca fluviatilis*	**0.731** (0.235)	**17.625** (5.732)
Eel	*Anguilla anguilla*	**0.266** (0.1)	**188.017** (97.002)
Roach/Bream Hybrid	*Rutilus rutilus X Abramis brama*	**0.108** (0.096)	**2.932** (2.601)

Fig.8 Mean (± S.E.) CPUE (numbers per m^2) and BPUE (weight g per m^2) for all fish species recorded on Camlough, 2016.

Fig 9. Gill net being hauled on Camlough, 2016.

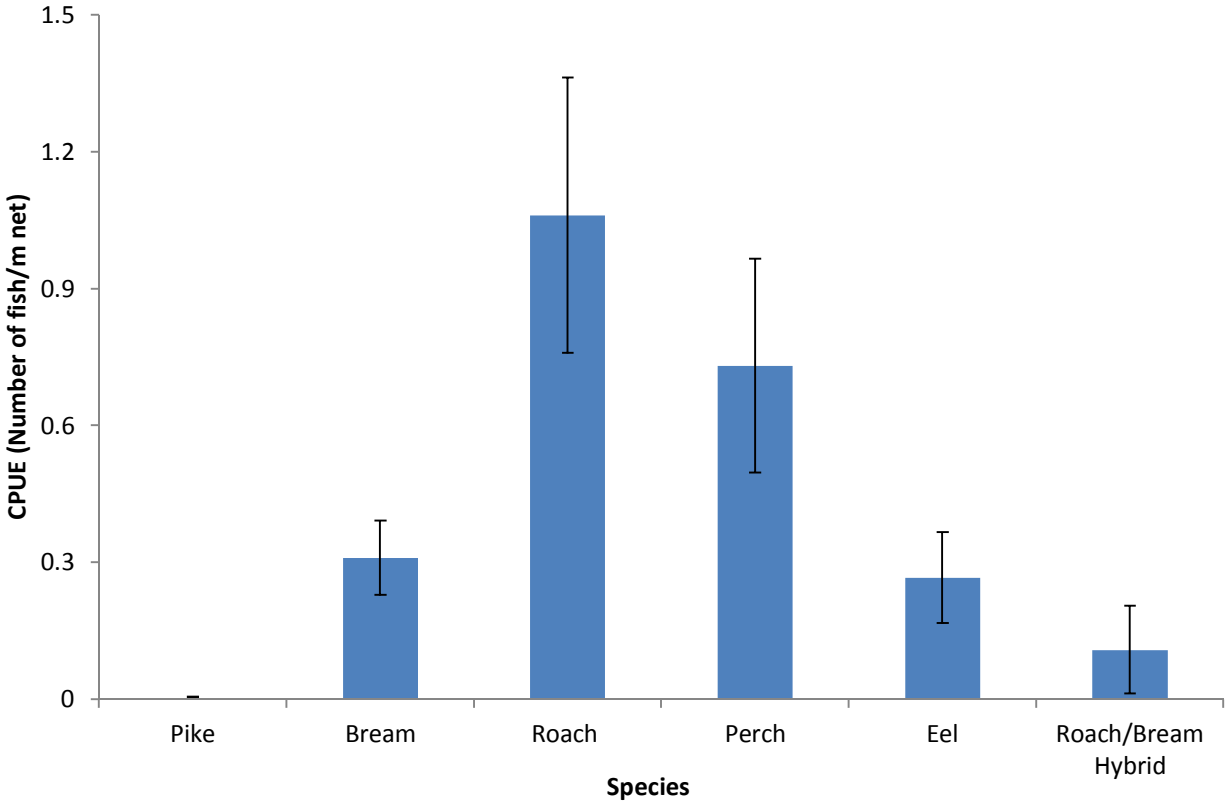

Fig 10. Mean (± S.E.) CPUE (numbers m^2) for all fish species captured in Camlough 2016 (Eel CPUE based on Fyke nets only).

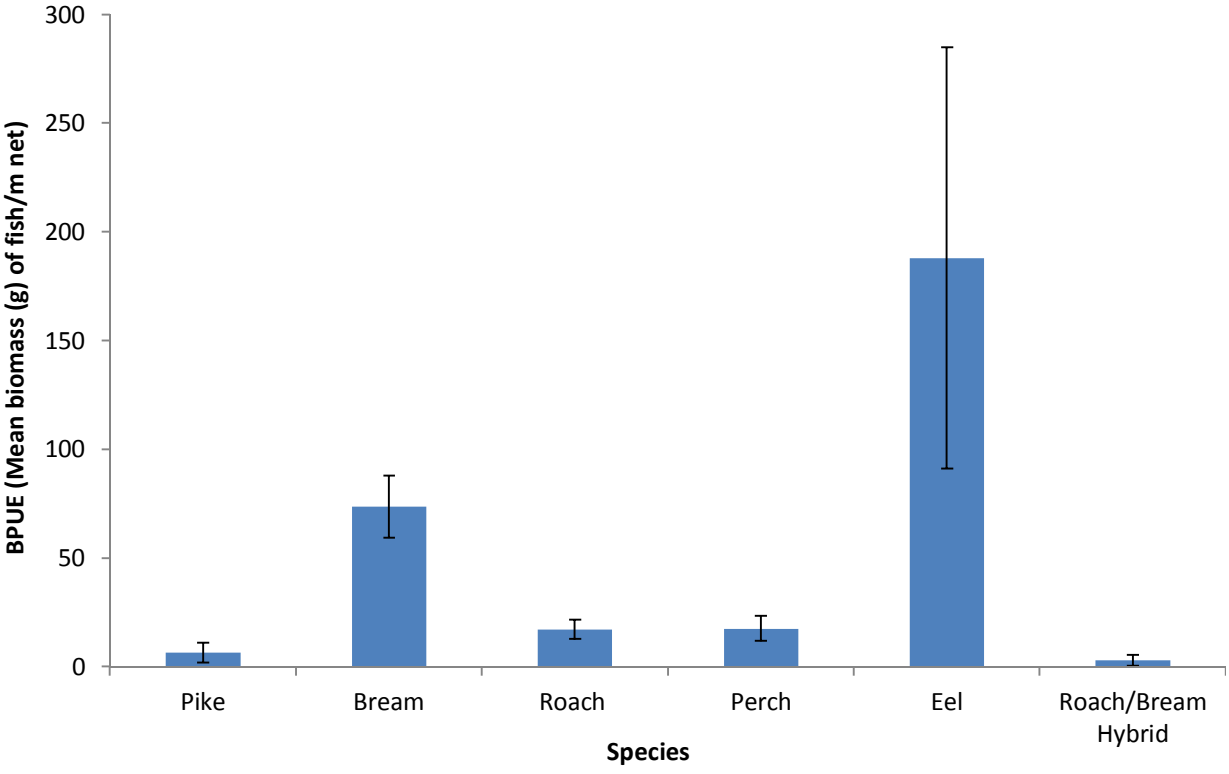

Fig 11. Mean (± S.E.) BPUE (weight g m^2) for all fish species captured in Camlough 2016 (Eel BPUE based on Fyke nets only).

3.3 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 area. A total of 2 Pike were recorded during the Camlough survey. It should be noted that Pike less than 35cm in length are rarely captured in these types of lake surveys during summer surveys as they remain in deeper habitats and are generally less active at this time of year. The Low Pike numbers caught during this survey are not necessarily indicative of a low Pike population, although this is possible and will be discussed further later in this report.

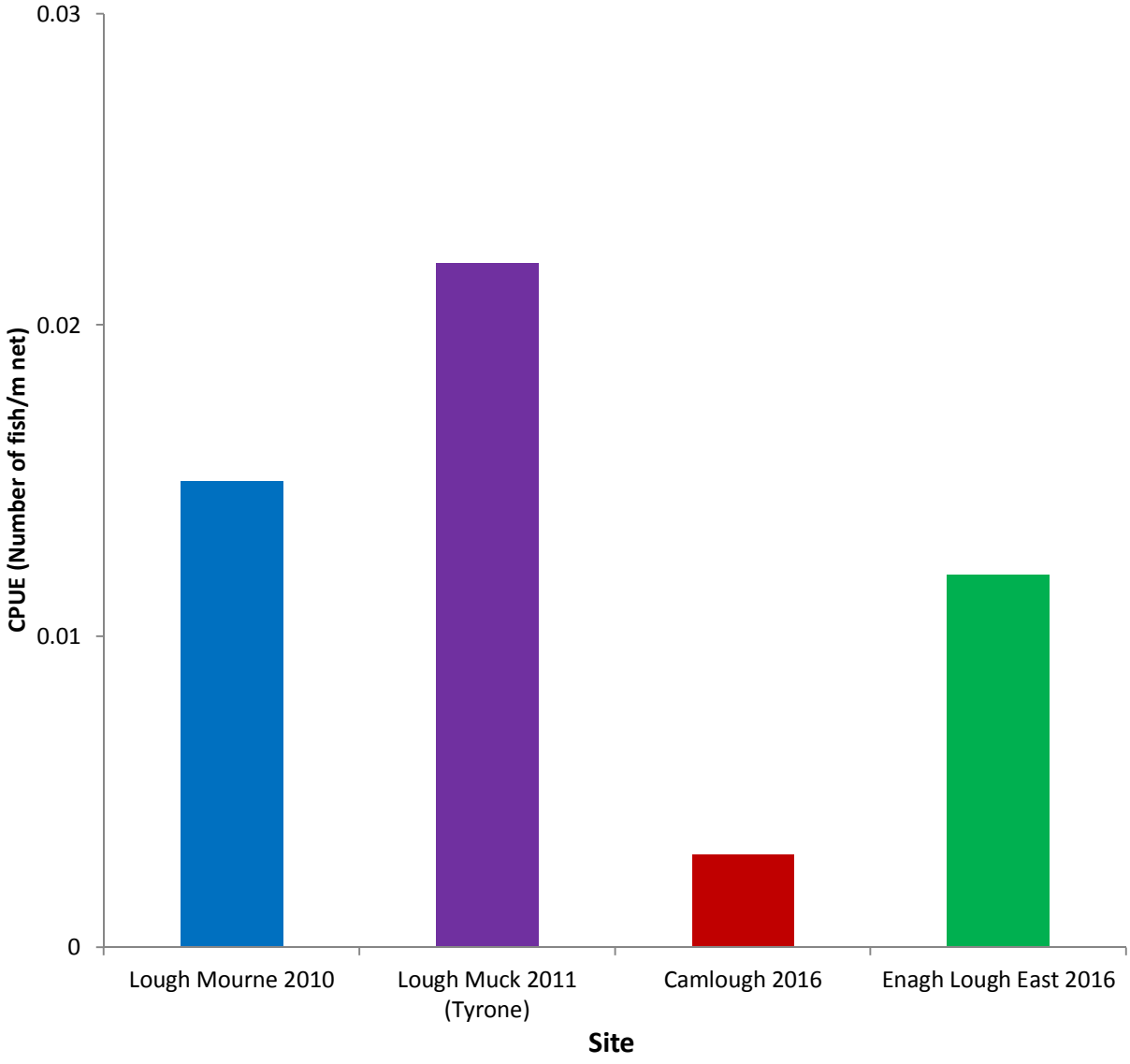

Fig 12. Mean CPUE for all Pike captured in Lough Mourne 2010, Lough Muck 2011, Camlough 2016 and Enagh Lough East 2016.

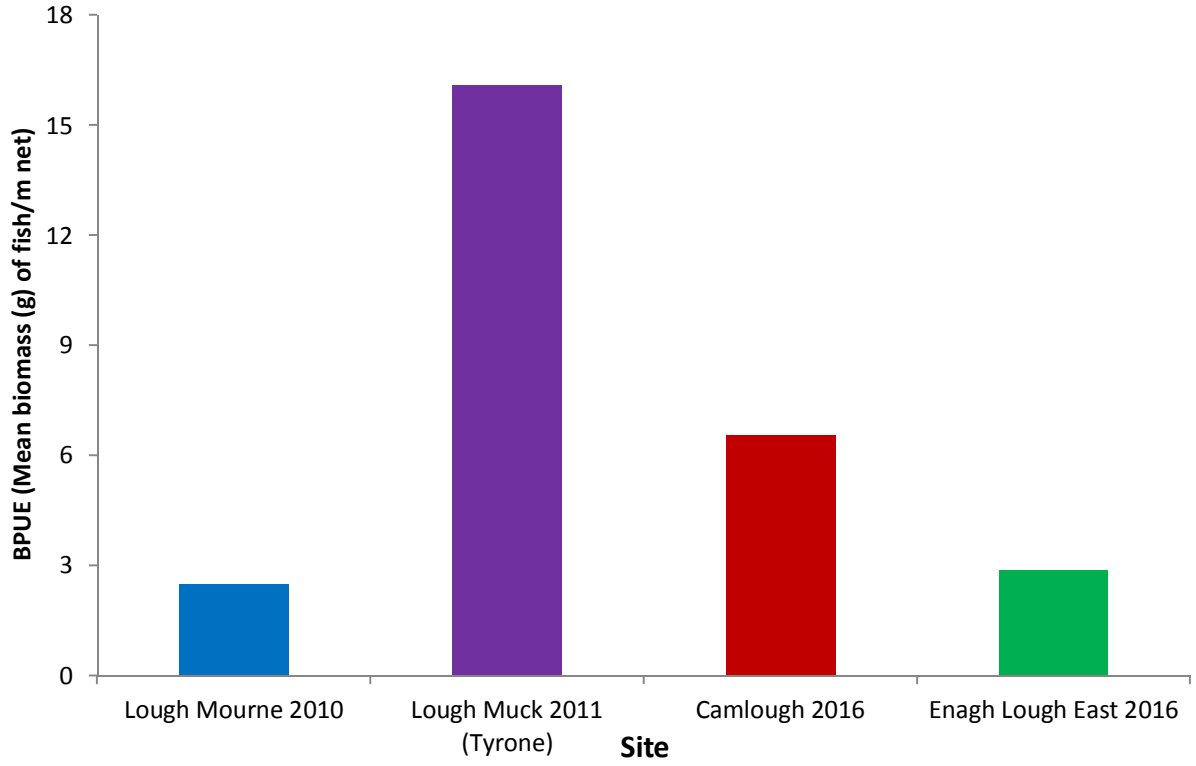

Fig.13 Mean BPUE for all Pike captured in Lough Mourne 2010, Lough Muck 2011, Camlough 2016 and Enagh Lough East 2016.

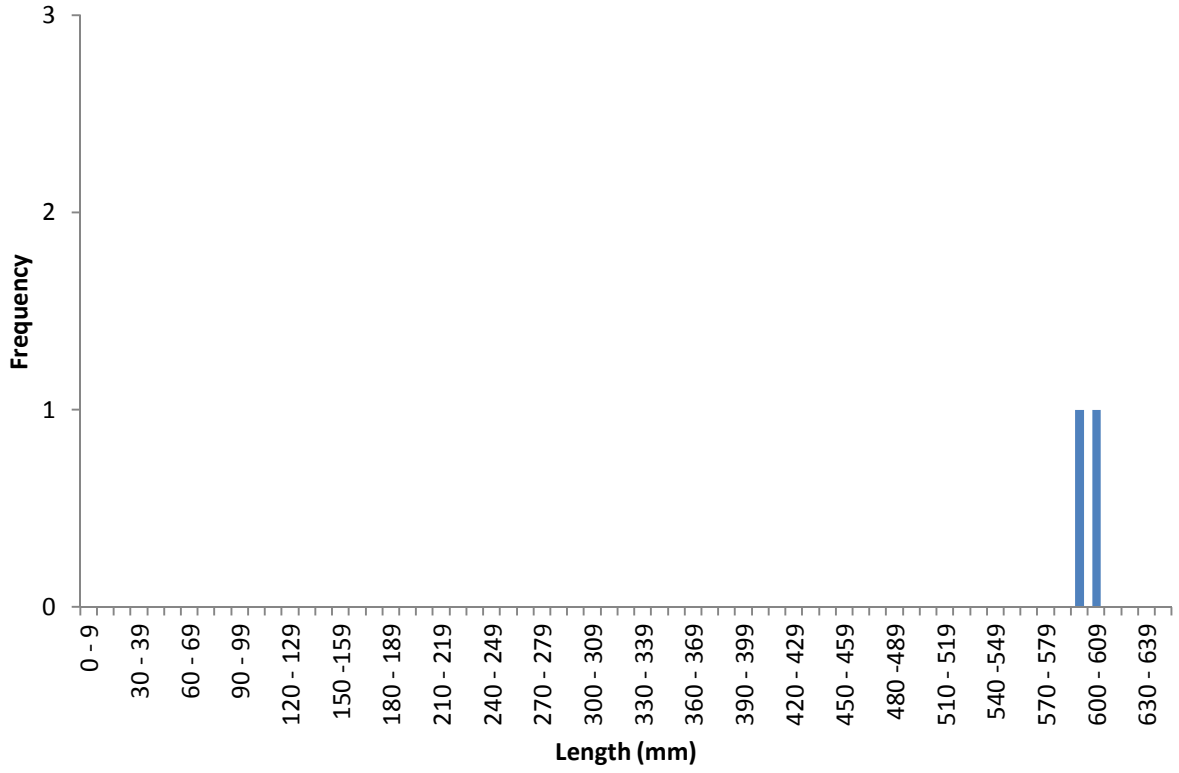

Fig 14. Length frequency Pike, Camlough 2016 (N=2)

3.4 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 Loughs Agency area. A total of 605 Roach were recorded in Camlough, lengths ranged from 58mm to 294mm (mean length 99mm). Roach are a species which thrive in nutrient high conditions and are susceptible to boom and bust population cycles. When compared with other surveyed loughs, the number of Roach in Camlough is relatively high, although they are generally smaller in size. 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). 302 Roach were recorded in Enagh Lough East 2016, lengths ranged from 50mm to 291mm (mean length 86mm).

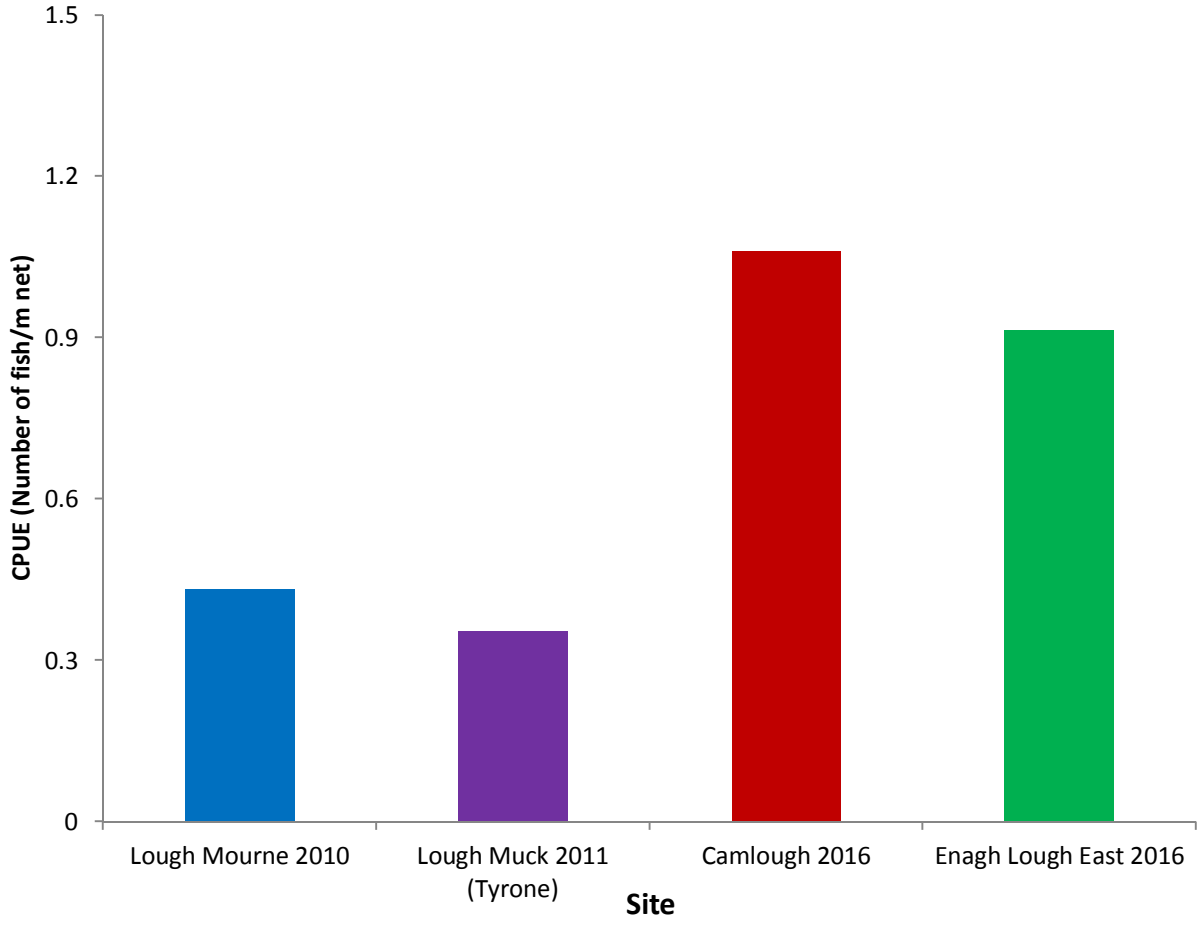

Fig 15. Mean CPUE for all Roach captured in Lough Mourne 2010, Lough Muck 2011, Camlough 2016 and Enagh Lough East 2016.

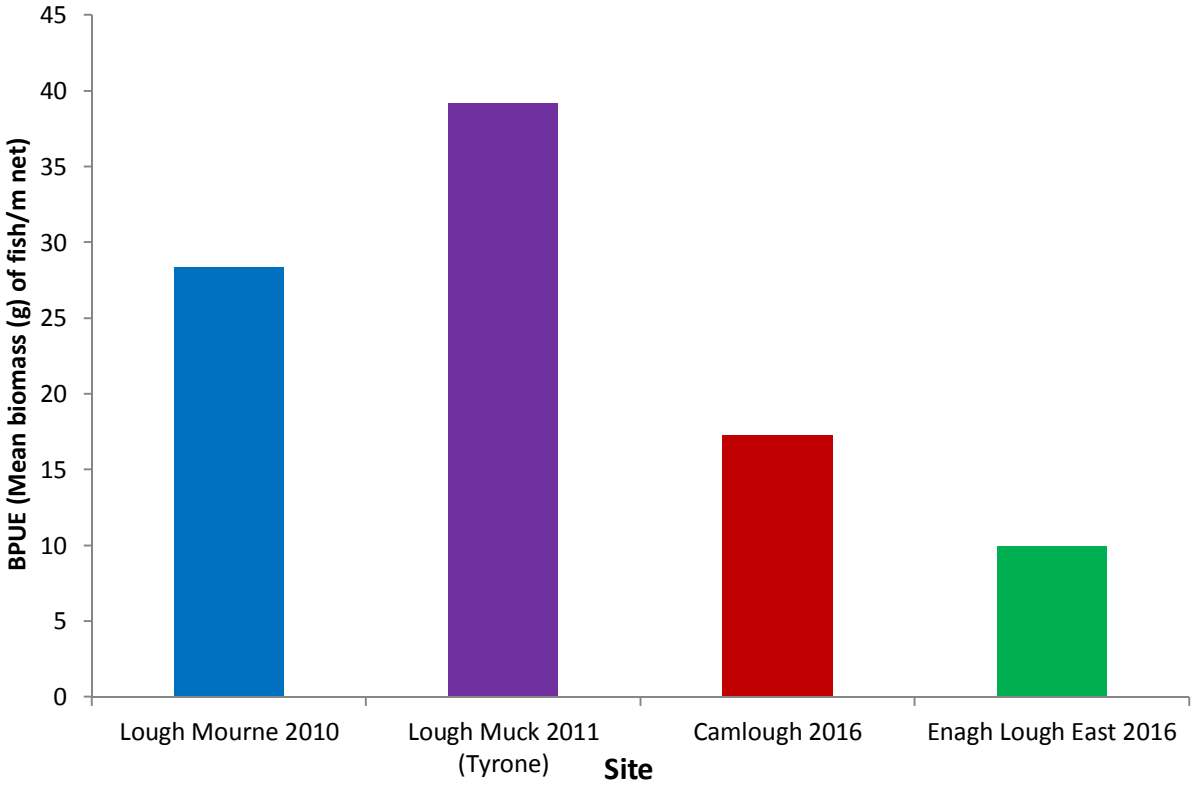

Fig 16. Mean BPUE for all Roach captured in Lough Mourne 2010, Lough Muck 2011, Camlough 2016 and Enagh Lough East 2016.

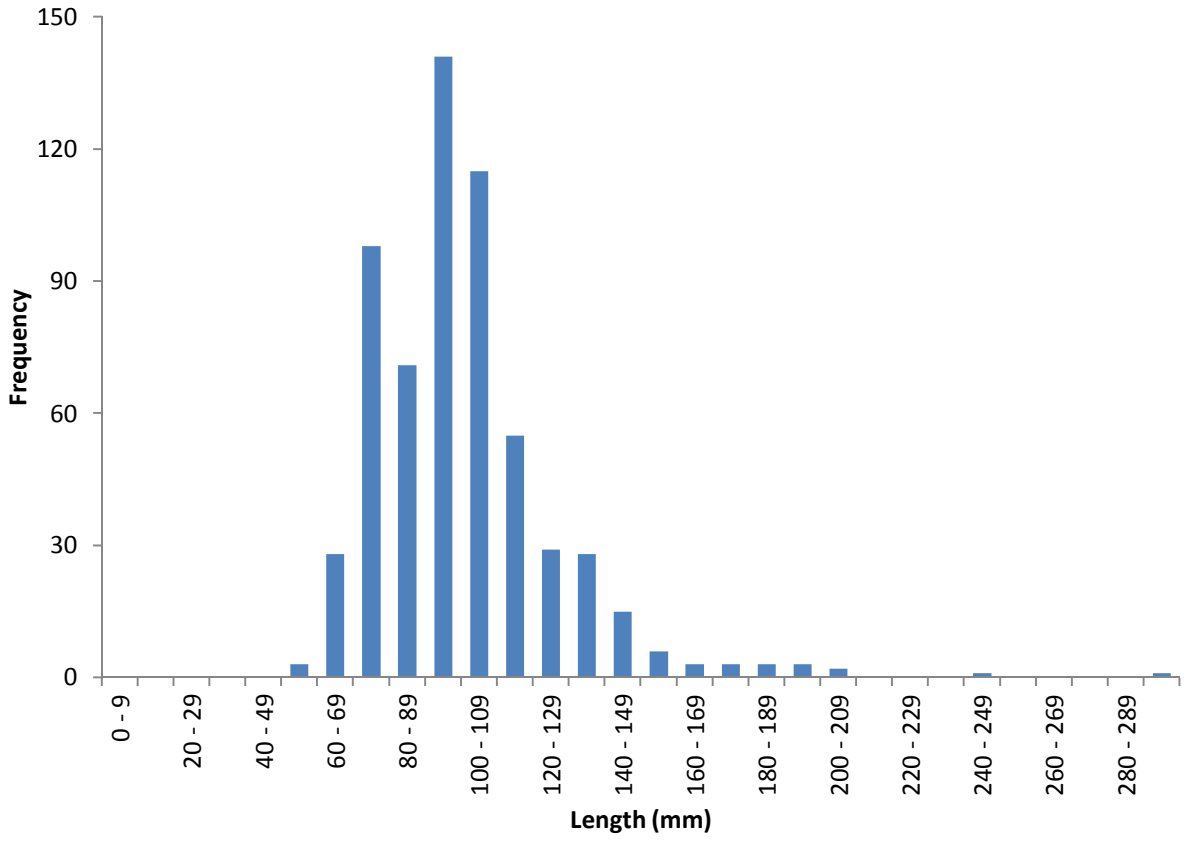

Fig 17. Length frequency Roach, Camlough 2016 (N=605).

3.5 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 area. A total of 417 Perch were recorded in Camlough, lengths ranged from 56mm to 255mm (mean length 110mm). Perch stocks in Camlough are also quite similar in comparison to other loughs surveyed in the Foyle area. 194 Perch were recorded in Lough Muck 2011, lengths ranged from 43mm to 330mm (mean length 113mm). 300 Perch were recorded in Enagh Lough East 2016, lengths ranged from 50mm to 287mm (mean length 88mm).

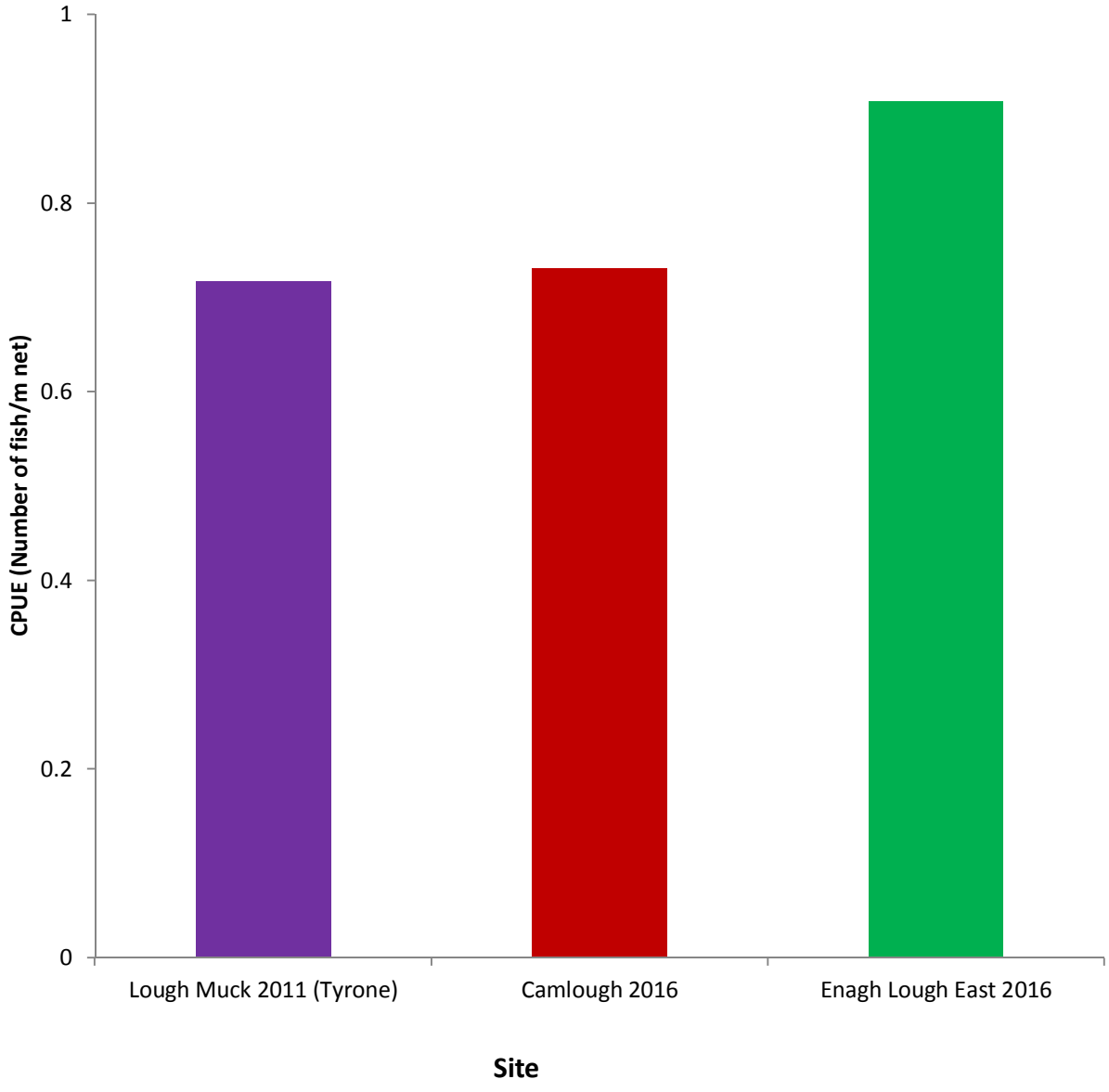

Fig 18. Mean CPUE for all Perch captured in Lough Muck 2011, Camlough 2016 and Enagh Lough East 2016.

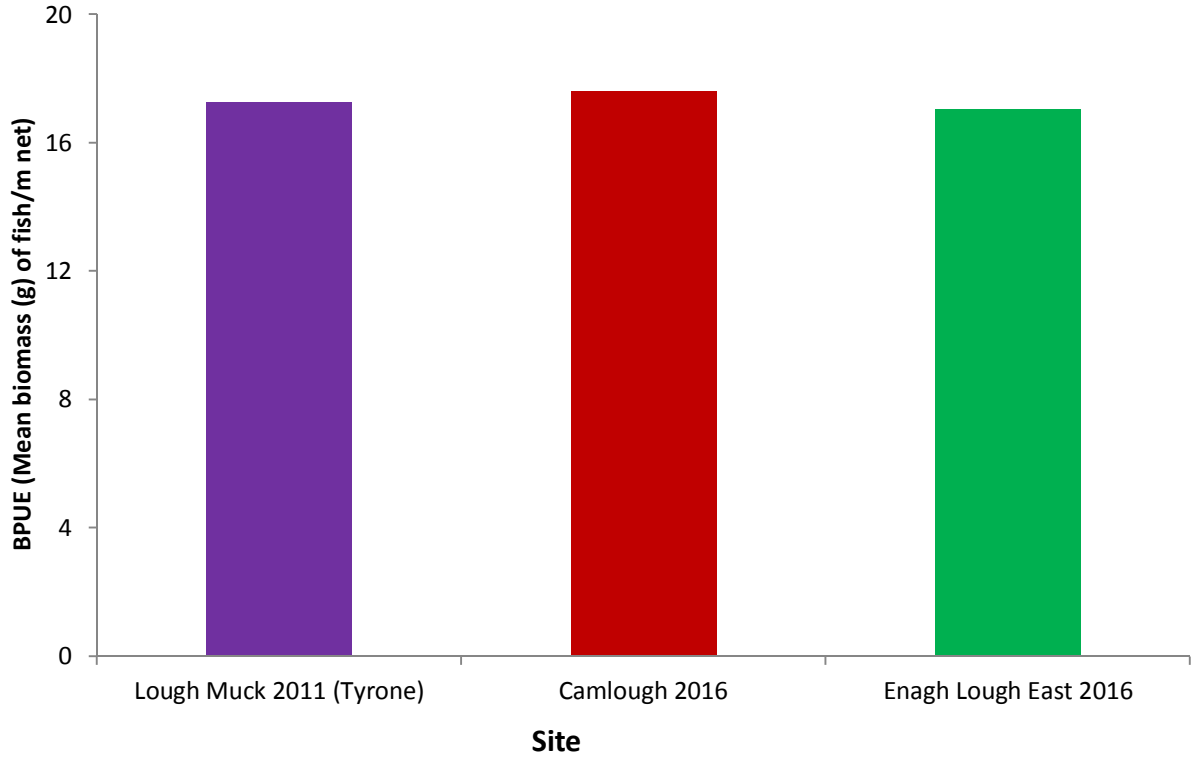

Fig 19. Mean BPUE for all Perch captured in Lough Muck 2011, Camlough 2016 and Enagh Lough East 2016.

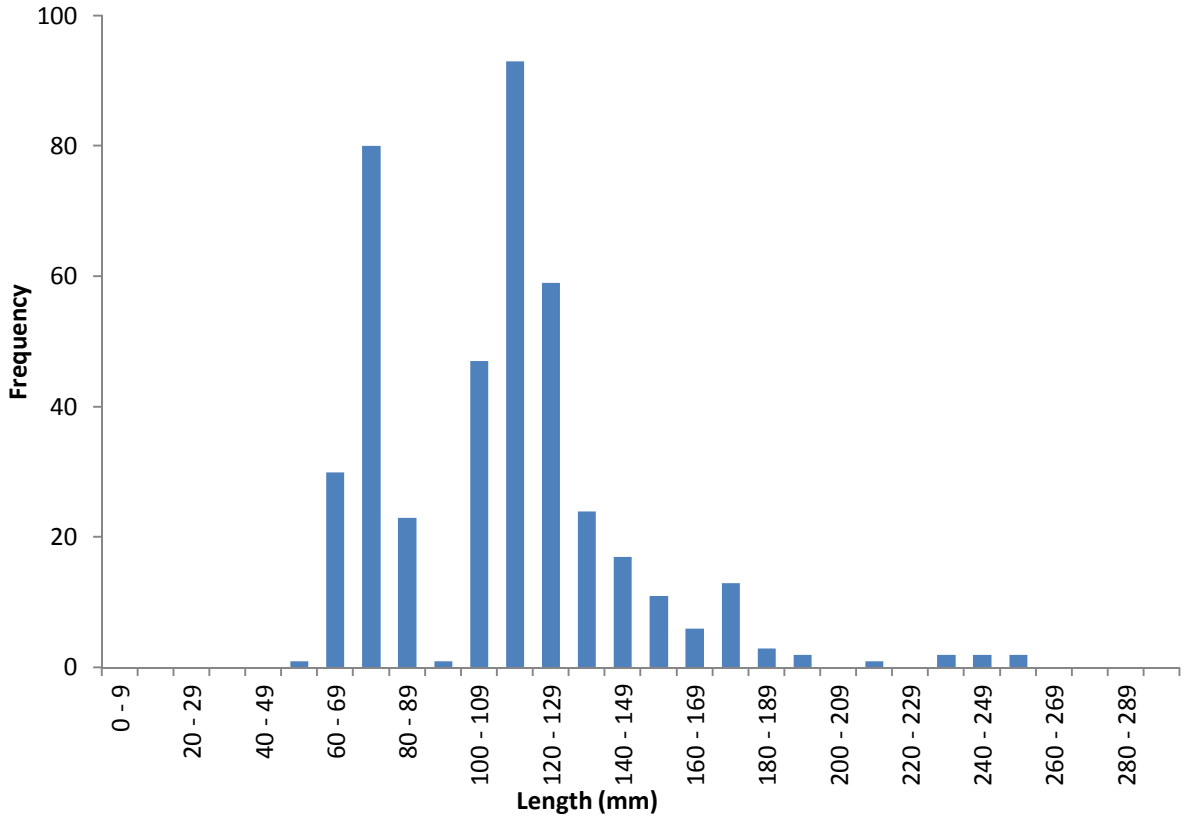

Fig 20. Length frequency Perch, Camlough 2016 (N=417).

3.6 EEL STOCK DENSITY & POPULATION STRUCTURE

The relative density (CPUE & BPUE) and length frequency distribution of Eels is presented below. A total of 25 Eels were recorded in Camlough, lengths ranged from 330mm to 749mm (mean length 529mm). Value are also compared Eel data from other lakes which have been surveyed within the Foyle area. Camlough appears to hold reasonable numbers of larger Eels suggesting that there is a sufficient food source to maintain the population. However, additional dietary analysis would be required to ascertain what food the Eels are primarily feeding on.

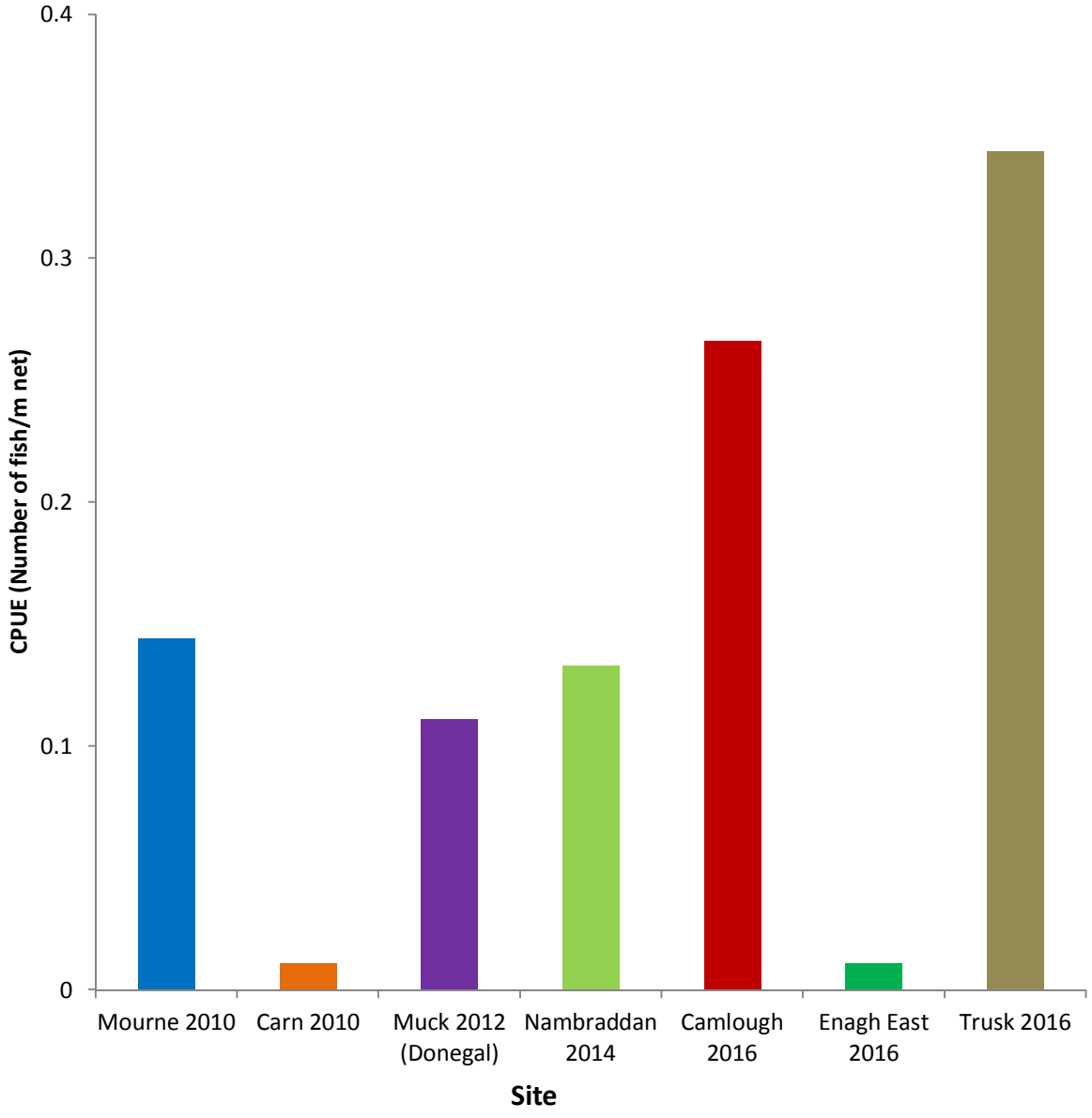

Fig 21. Mean CPUE for all Eels captured in Lough Mourne 2010, Lough Carn 2010, Lough Muck 2012, Lough Nambraddan 2014, Camlough 2016, Enagh East 2016 and Lough Trusk 2016.

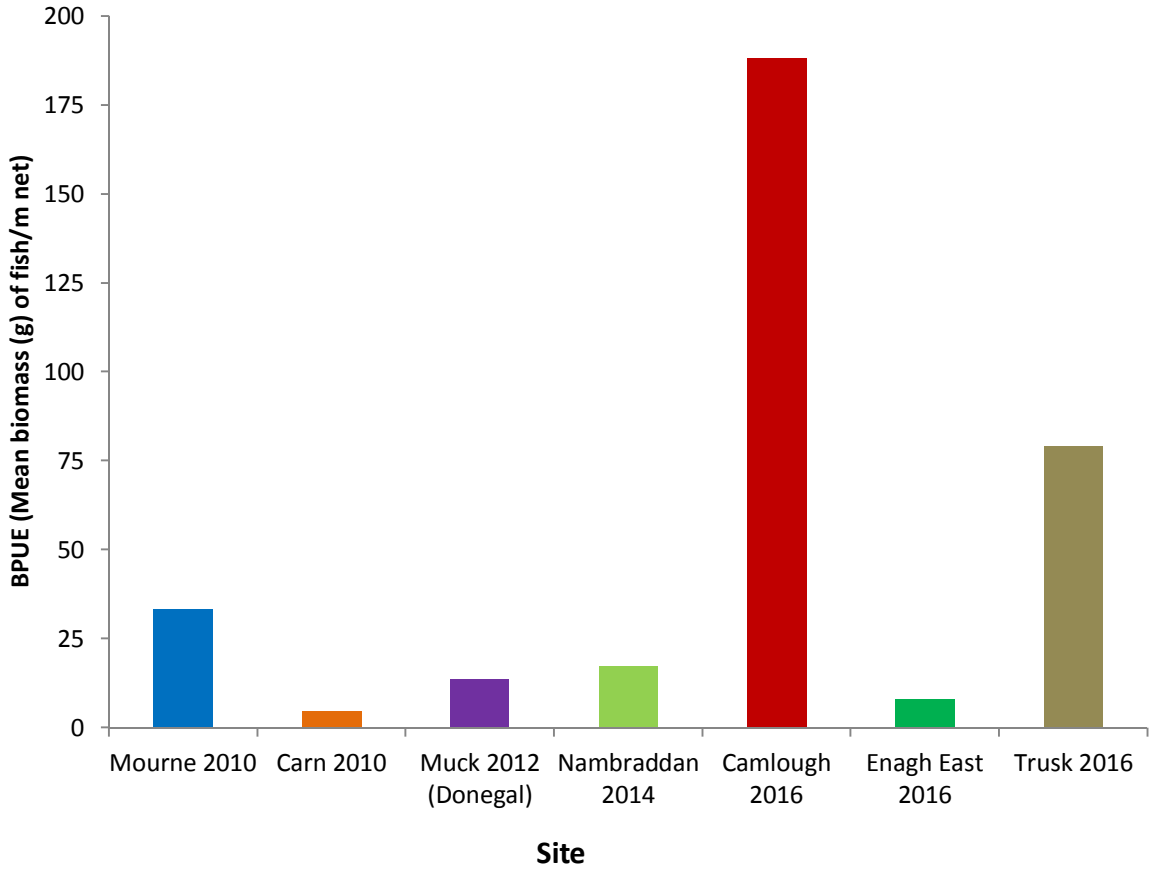

Fig 22. Mean BPUE for all Eels captured in Lough Mourne 2010, Lough Carn 2010, Lough Muck 2012, Lough Nambraddan 2014, Camlough 2016, Enagh East 2016 and Lough Trusk 2016.

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

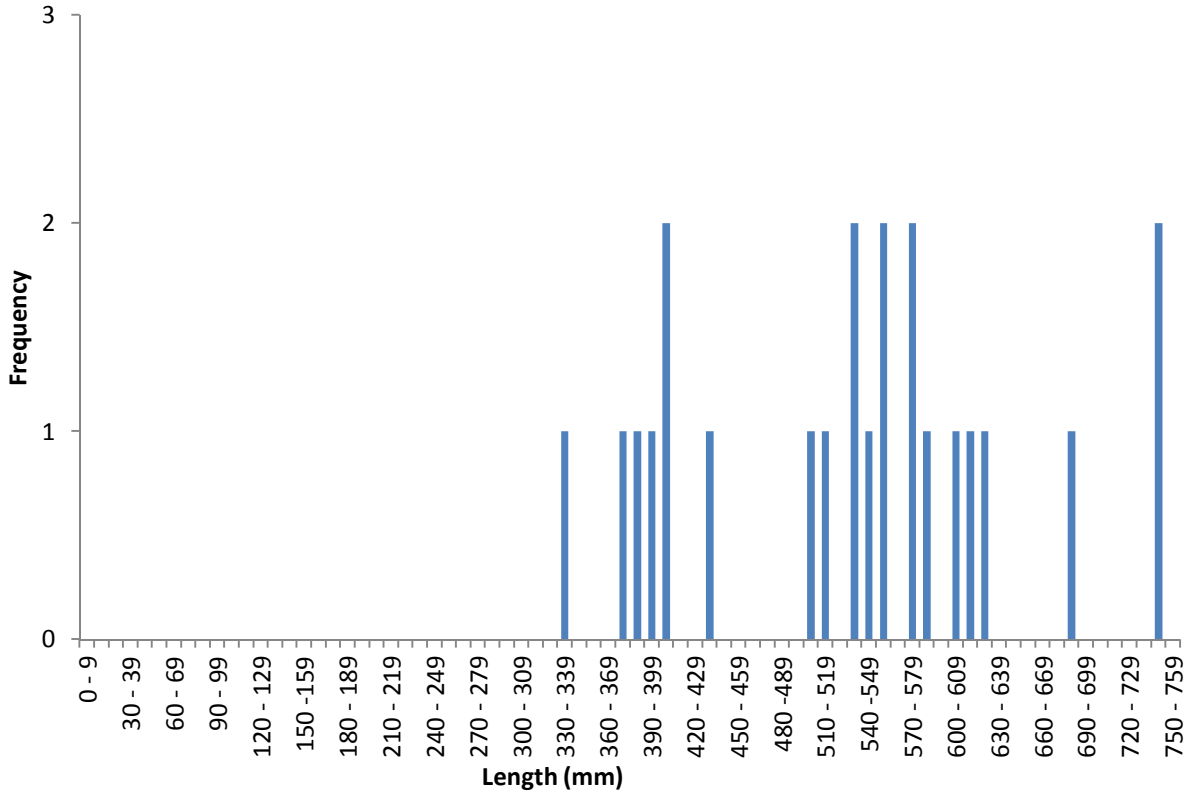

Fig 24. Length frequency Eel, Camlough 2016 (N=23).

3.7 BREAM AND ROACH X BREAM HYBRID STOCK DENSITY & POPULATION STRUCTURE

The relative density (CPUE & BPUE) and length frequency distribution of Bream and Roach X Bream hybrids is presented below. A total of 177 Bream were recorded in Camlough. Bream lengths ranged from 75mm to 495mm (mean length 190mm). A total of 62 Roach/Bream hybrids were also recorded during the 2016 survey. Roach/Bream hybrid lengths ranged from 65mm to 200mm (mean length 118mm). Up until now the Loughs Agency has not encountered any Bream or Roach X Bream hybrids in previous lake fish surveys as they are restricted to a small number of water bodies in the Carlingford area. An ample amount of time and effort was made available to accurately identify Roach X Bream hybrids. However there is some very minor potential for crossover given the degree of hybridisation in several cases. Once field staff establish familiarity with hybrids on a more regular basis, identification techniques may become more sophisticated and less time consuming.

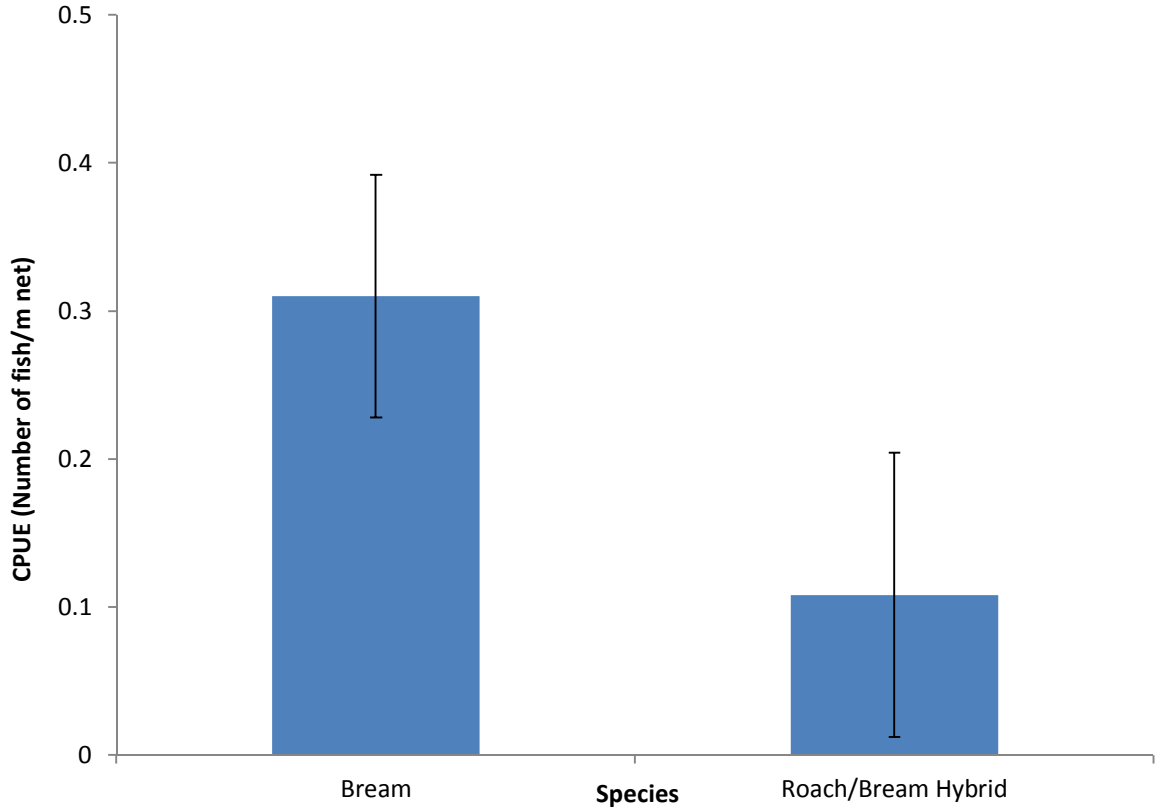

Fig 25. Mean (± S.E.) CPUE for all Bream & Roach/Bream hybrids captured in Camlough, 2016.

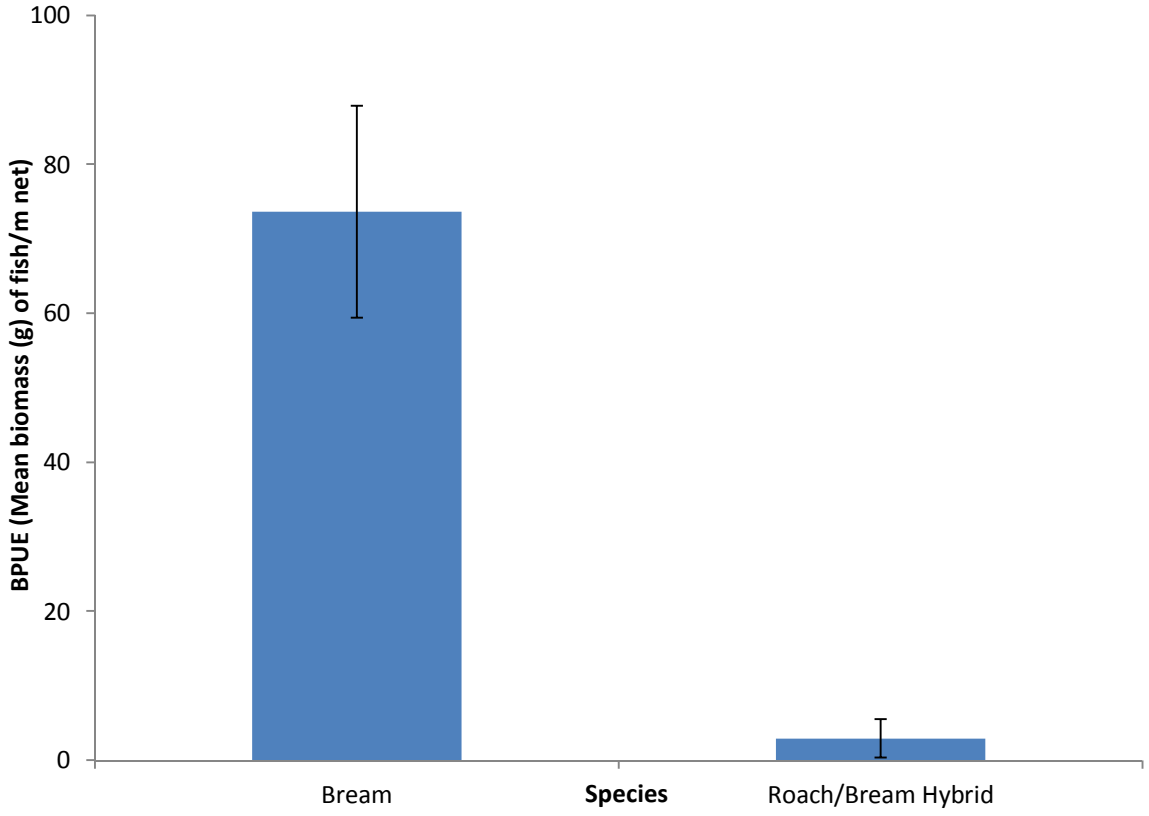

Fig 26. Mean (± S.E.) BPUE for all Bream & Roach/Bream hybrids captured in Camlough, 2016.

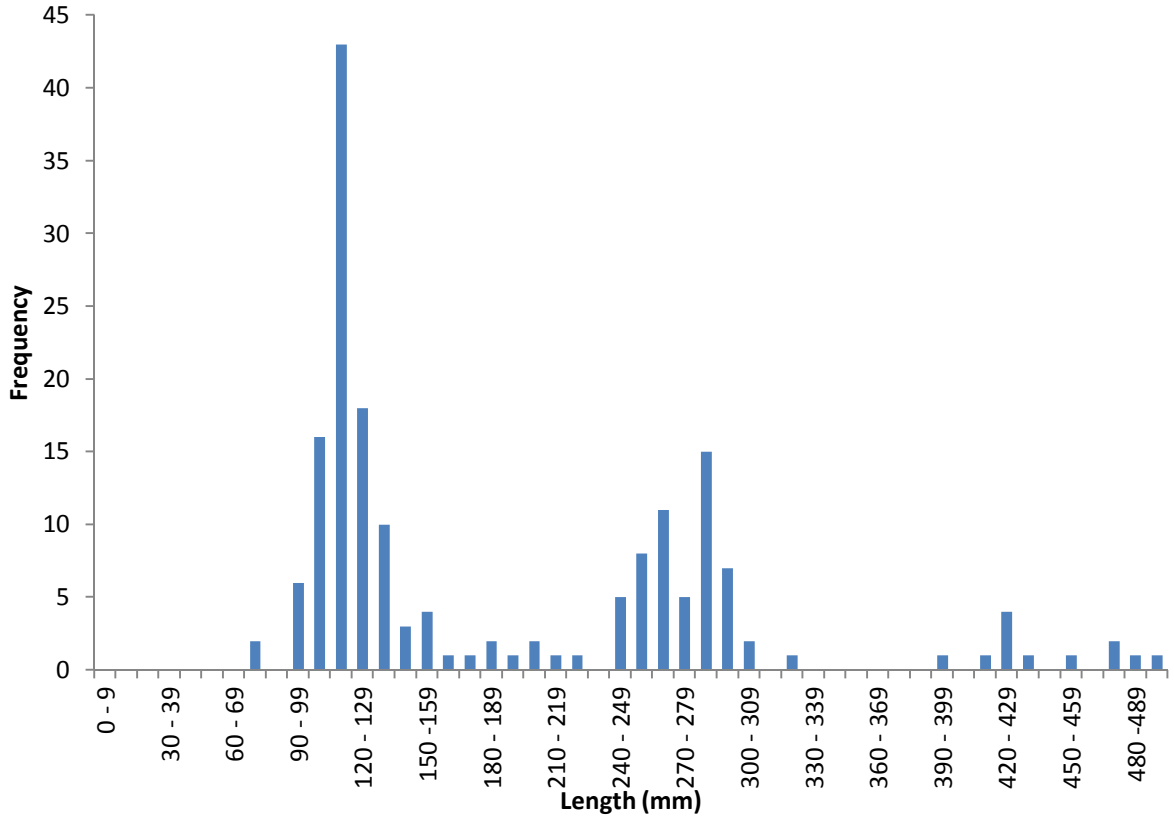

Fig 27. Length frequency Bream, Camlough 2016 (N=177).

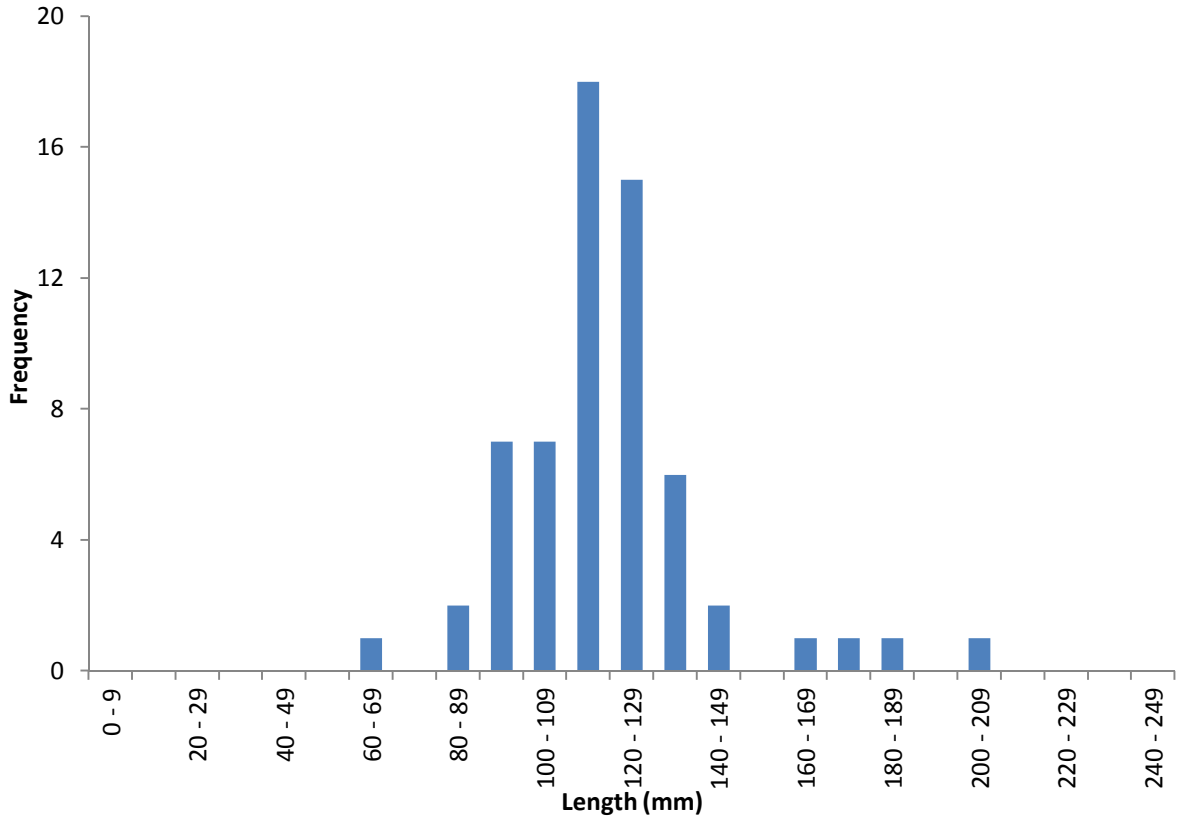

Fig 28. Length frequency Roach/Bream hybrids, Camlough 2016 (N=62).

3.8 FISH AGE AND GROWTH

Fish aging was carried out on number of Roach, Perch and Bream that were caught during the Camlough survey. Aging was not carried out on the Roach X Bream hybrids. Growth curves depicting length at age for Roach, Perch and Bream are presented in Figures 29, 30 & 31 below. A very small subsample of 8 Roach were aged using scale analysis with most of the fish being in the 3+ and 4+ age class. The oldest Roach was found to be in the 6+ age class. A total of 86 Perch were aged by using the operculum bone from each fish. There were a range of age classes found in Camlough with the oldest Perch deemed to be in the 4+ age class. A subsample of 18 Bream were also selected for scale analysis with a variety of age classes present. The oldest Bream was found to be in the 11+ age class. Growth rates for all three species are comparable to other loughs surveyed across Ireland.

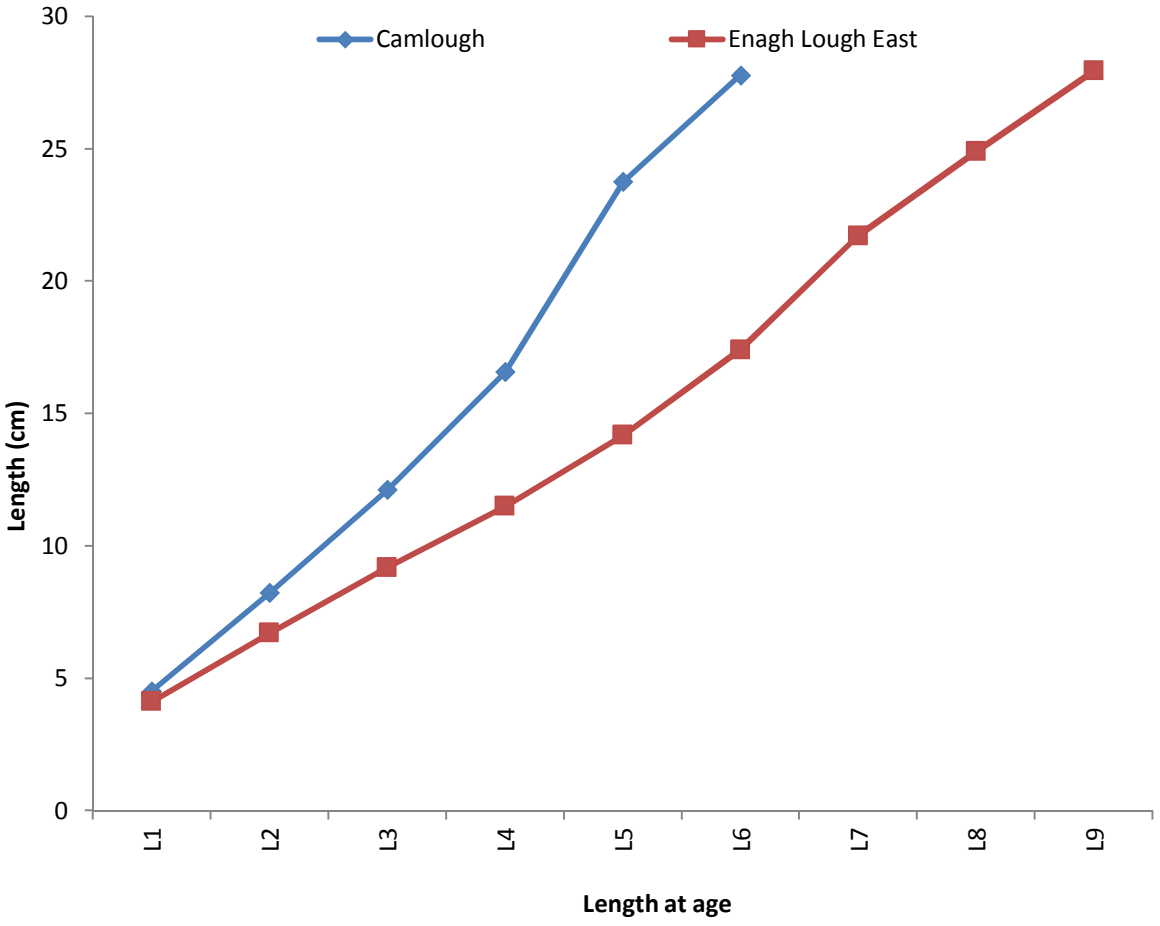

Fig 29. Comparison growth curve showing back calculated length at age for Roach, Camlough and Enagh Lough East 2016.

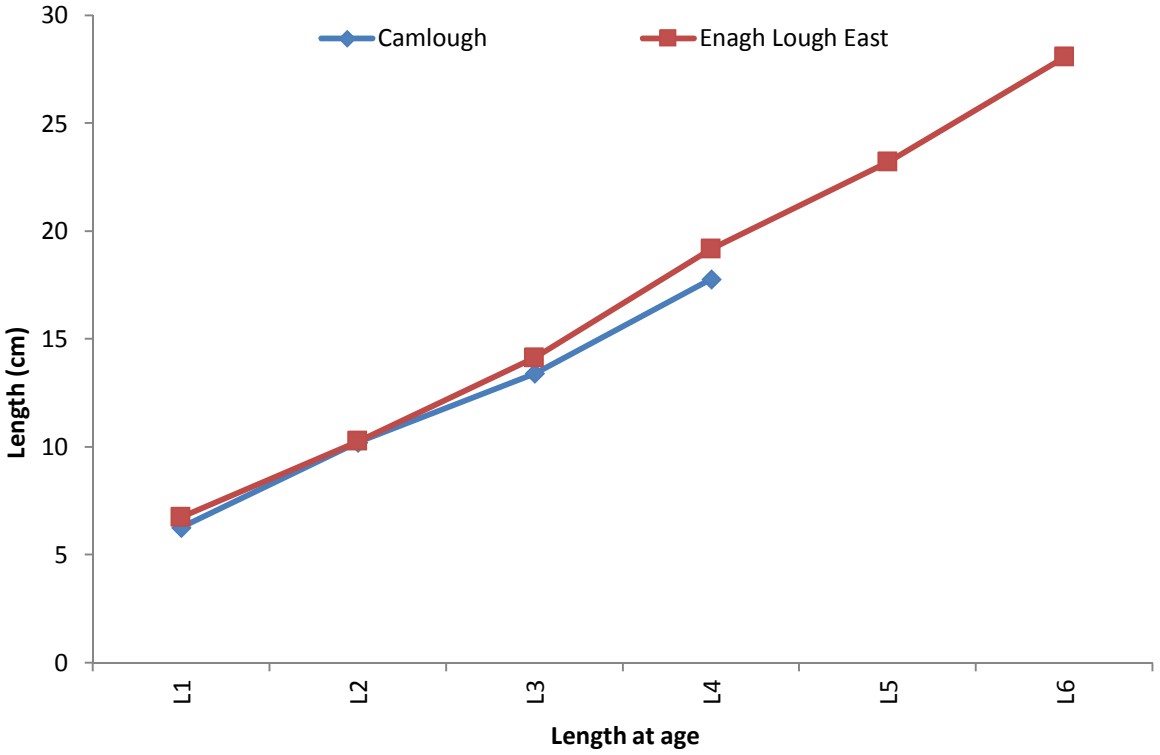

Fig.30 Comparison growth curve showing back calculated length at age for Perch, Camlough and Enagh Lough East 2016.

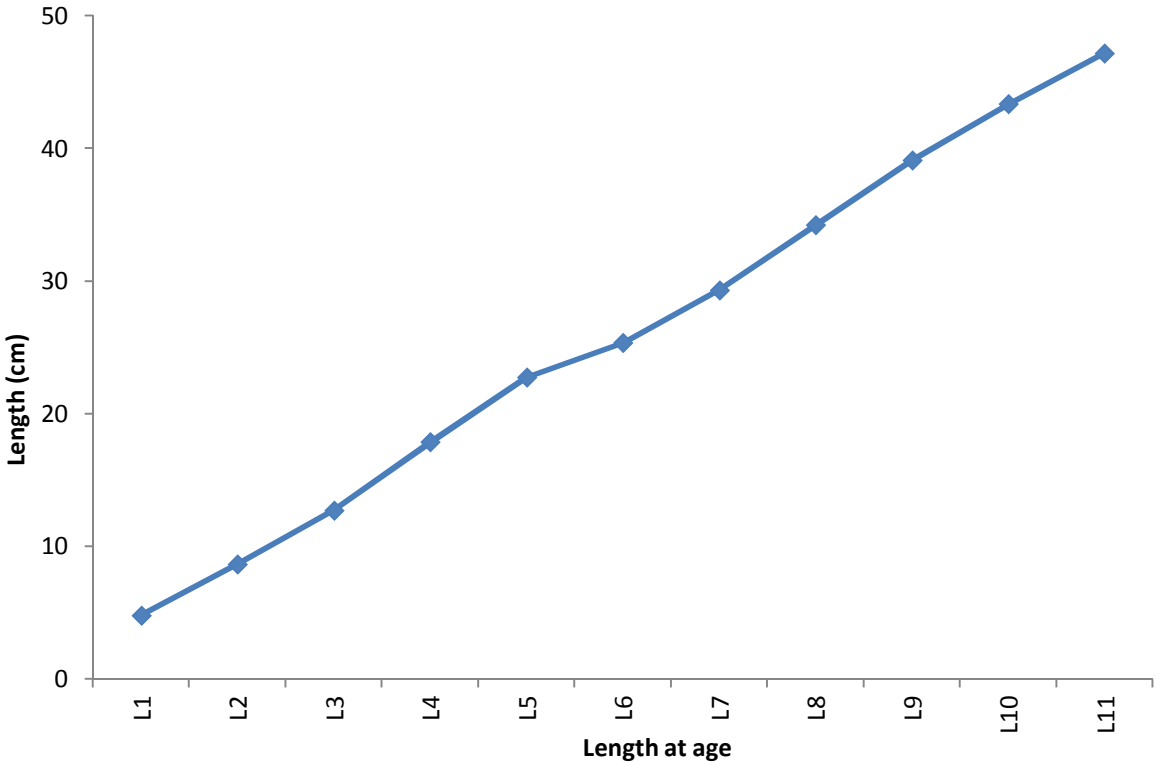

Fig.31 Growth curve showing back calculated length at age for Bream, Camlough 2016.

4.0 DISCUSSION

The Camlough fish survey has been the largest lake fish survey undertaken by the Loughs Agency Freshwater Fisheries Monitoring Team. This represents the first baseline scientific survey of fish stocks carried out on Camlough. Roach were found to be the dominant species in Camlough. The population generally consists of large numbers of smaller fish of varying age classes with the oldest Roach found to be in the 6+ age class. Roach only accounted for a small proportion of the fish biomass within the lough however this species are known to be susceptible to boom and bust cycles. Eels were also present and were found to have the largest biomass of any species in the lough. In fact the biomass of Eels in Camlough is the by far largest out of all the lakes surveyed in the Foyle and Carlingford areas since 2010. Only 2 Pike were recorded during the Camlough survey. As mentioned earlier Pike may utilise deeper habitats and become more sedentary during the summer months, making capture less likely. One cause for concern is the fact that Camlough had the lowest CPUE of any lake with Pike present that has previously been surveyed within the Loughs Agency areas. This point requires further investigation and may suggest that Pike are experiencing greater angling pressure than in other water bodies. Compliance with fishery regulations is essential to ensure a healthy population.

This report is a baseline survey of fish stocks in Camlough and it is hoped that it can provide the basis for an evidence based approach to the management of the lough. Fishery managers and anglers should also have an opportunity to review the report and consider its recommendations when developing any future angling initiatives for Camlough.

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.

5.0 FISHERY REGULATIONS

The Foyle and Carlingford area (Coarse Angling) Regulations (2009) define coarse fish as being either Bream, Carp, Perch, Roach, Rudd, Tench or any species of fish which includes a hybrid of that species. The regulation prohibits and restricts the killing and taking of coarse fish by rod and line and also states

that any coarse fish taken by rod and line should be returned immediately to the waters from which it was taken without avoidable injury. In addition to this it is also prohibited to kill or take Eels in the Foyle and Carlingford areas, however there is a bag limit of 2 Pike weighing 4 kg or less, on any one day. Pike of 4kg or more must be returned unharmed to the water. There is an exception for specimen pike with a bag limit of 1 specimen pike in any one day (a specimen pike in a river is 9 kg or more; a specimen pike in a lake is 13.6 kg or more).

6.0 INVASIVE SPECIES

Invasive non-native species are those which have been transported outside of their natural range. They are also capable of spreading rapidly and colonising a wide range of habitats. They 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 stream 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 now 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 river and stillwater 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 is a growing number of invasive non-native species colonising freshwater habitats within 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.

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 significant 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. Himalayan Balsam, Japanese Knotweed and Giant Hogweed die back in winter, the lack of vegetation on the riparian zone leaves the bank highly susceptible to soil erosion at times of increased 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 currently at low levels as a result of 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 exacerbates the problems faced by Atlantic salmon.

The potential for other INNS to colonise the stillwaters of the Foyle and Carlingford areas is a tangible threat with many species of invasive invertebrates, aquatic plants or fish already present within Ireland and the UK. Raising awareness and practicing effective biosecurity measures is key to preventing this spread.

7.0 BIOSECURITY

It is imperative that field operations or recreational activities do not exacerbate the risk to the environment and economy posed by invasive 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 other staff operating in the field. The Loughs Agency biosecurity protocol for field operations was fully implemented during the Camlough lake fish survey.

8.0 RECOMMENDATIONS

- Repeat lake fish survey every 5 years.
- Compare results against any future surveys to ascertain comparative growth rates across a range of stillwaters of the Foyle & Carlingford areas.
- Communicate findings internally to colleagues and externally to stakeholders or local angling groups.
- Continue to conduct stillwater fish surveys temporally and spatially within the Foyle and Carlingford areas.
- Provide the fishery managers and anglers with a copy of the survey report.
- Ensure that any future evidence based management decisions or angling initiatives take account of the findings of this baseline report.
- Promote Biosecurity awareness with angling community

9.0 REFERENCES

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