LOUGHS AGENCY OF THE FOYLE CARLINGFORD AND IRISH LIGHTS COMMISSION

# Stillwater Status Report: Lough Finn

## Stillwater Fish Stock Survey

**Loughs Agency of the Foyle Carlingford and Irish Lights Commission**

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**December 2017**

A lake fish stock assessment was conducted to record indicative species composition and abundance of Lough Finn, Co. Donegal during the Autumn of 2017.

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## EXECUTIVE SUMMARY

A Water Framework Directive compliant stillwater fish stock assessment was carried out on Lough Finn in September 2017. 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.

Lough Finn is situated in West Donegal approximately 25km West of Ballybofey and is the source of the River Finn. The lough is nestled at the base of the bluestack mountain range. Fintown lies on the Northern shore of Lough Finn. Previous baseline fisheries and Euopean eel scientific surveys have been conducted but did not follow Water Framework Directive compliant methods. Accurate depth (bathymetry) data was available to direct the fish survey.

The 2017 fish stock assessment noted the presence of four fish species in Lough Finn including Brown trout, Arctic charr, European Eel and Minnow. Brown trout were the most common fish encountered in the survery. It is notable that a healthy population of Artic charr is present in the Lough. Water levels can fluctuate quite quickly on Lough Finn following periods of rainfall. This has been exacerbated in recent years by unauthorised drainage works which were conducted at the outflow from Lough Finn. Substrate was added to the outflow to mitigate the effects of the unauthorised dredging but the lowered bed level still appears to be having an impact upon water retention within Lough Finn and potentially upon the Lough Finn and River Finn fisheries.

This lake survey report provides a baseline of species presence and their relative abundance to resource managers and anglers alike. It is anticipated that this survey report could contribute towards any future management and sustainable development of the angling amenity, conservation of the nationally vulnerable Arctic charr population and wider development of the lough by providing 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 Lough Finn and provided to the Environmental Protection Agency for national reporting purposes.

## 1.0 INTRODUCTION

Lough Finn is located in West Donegal besdie the town of Fintown, in the Foyle catchment. The principal dimensions are;

- Length: 4.1km long
- Maximum width: 0.38 km
- Surface area: 115 hectares
- Maximum depth: 24 metres


Fig 1. Stillwater Fish Survey being carried out on Lough Finn, 2017.

## 2.0 BATHYMETRY SURVEY

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 (m) are used to determine the distribution and number of gill nets required for the survey. A bathymetery survey for Lough Finn had been previously completed prior to the lake fish survey. This information was used to direct the fish survey.


Fig 2 . Lough Finn survey underway

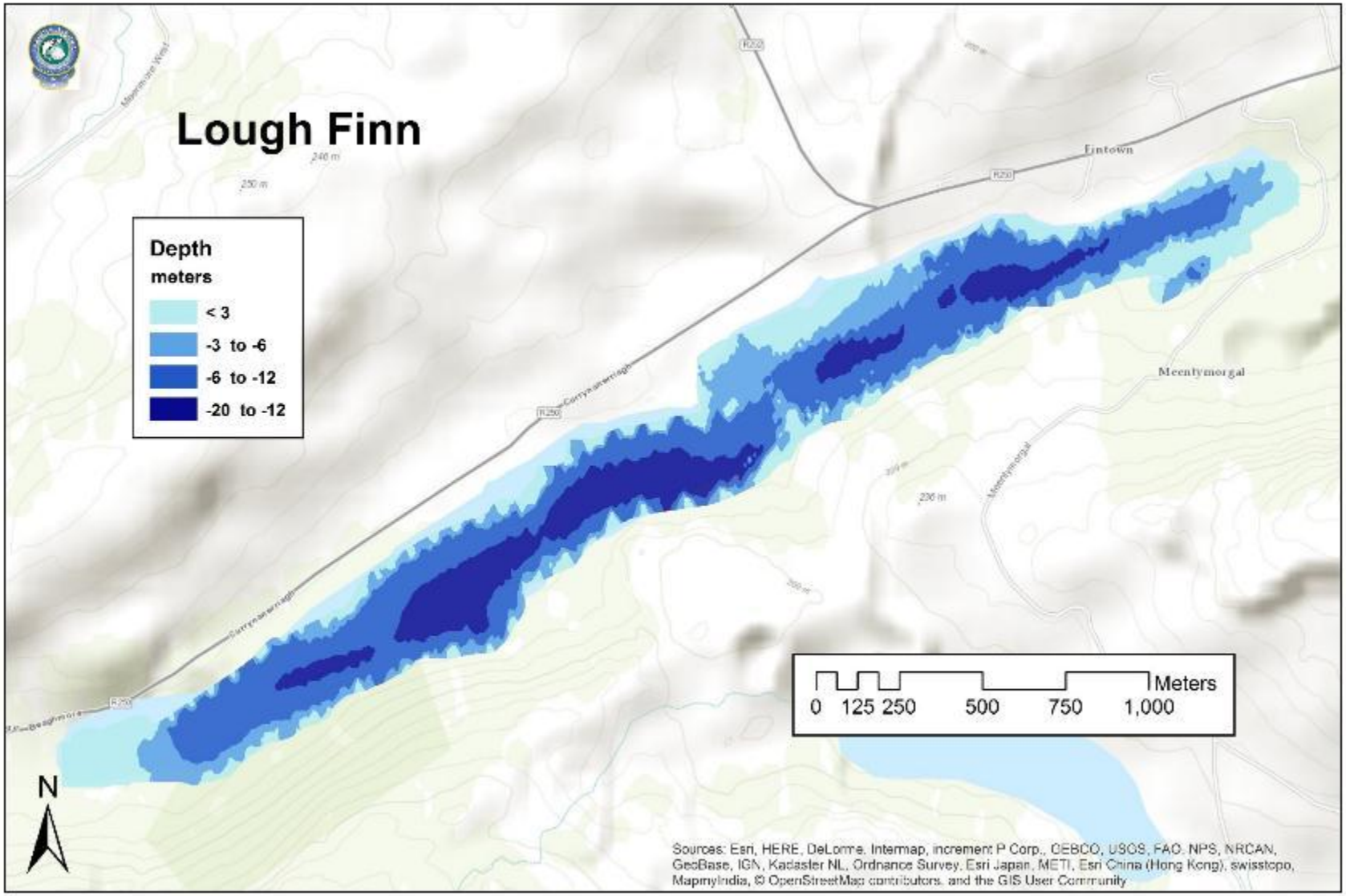


Fig 3. Bathymetry map of Lough Finn, Co Donegal

## 3.0 METHODS

Nets on Lough Finn were set on the 12th of Spetember 2017 and left overnight and collected on 13th September 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 31 nets were set as summarised in Table 1 below.

| Net type | No. Deployed | Water depth (m) |
|---|---|---|
| Dutch fyke nets (chain of 3) | 6 | 0 – 2.9 |
| Multi-mesh gill nets | 4 | 0 – 2.9 |
| Multi-mesh gill nets | 4 | 3 – 5.9 |
| Multi-mesh gill nets | 5 | 6 – 11.9 |
| Multi-mesh gill nets | 4 | 12 – 19.9 |
| Multi-mesh gill nets | 4 | >20 |
| Floating gill net | 4 | 18-21 |

Table 1. Details of survey nets deployed on Lough Finn survey.

Fig 5. Nets being prepared before being deployed on Lough Finn.

Survey locations were chosen within randomly selected 50m X 50m grid squares overlaid on a bathymetric map of the lough (Figure 3). The location and depth of each net is also shown in figure 4. A handheld Trimble Geo HT GPS was used to record the precise location of each net as shown in Figure 4 above. Any fish which were alive and in good condition were measured and released live after removal from the nets, this included all eels caught in fyke nets. All other fish were removed from the nets, identified and measured at Loughs Agency headquarters.

Fig 6. Lough Finn

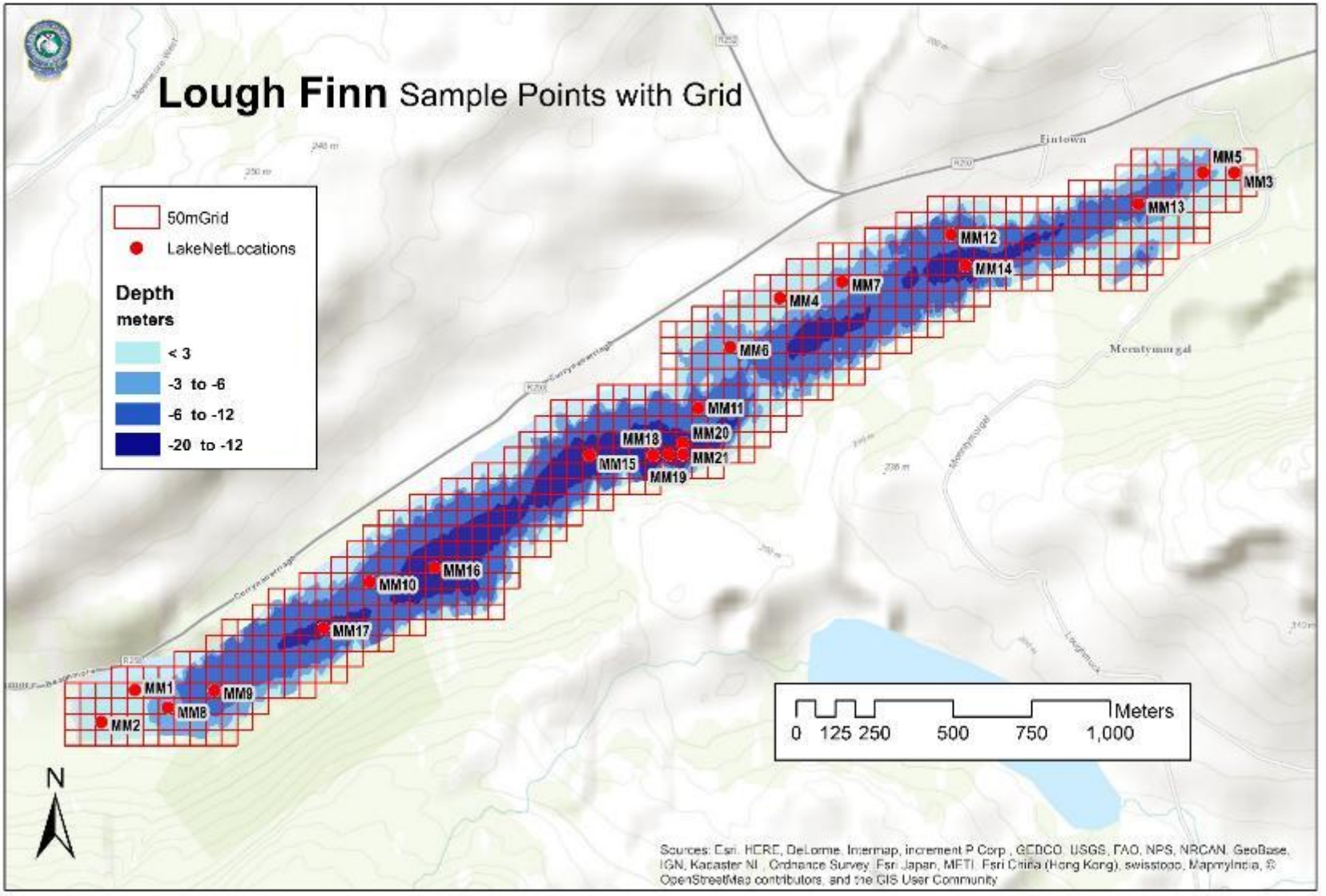


Fig 7. Lough Finn bathymetry map with 50m x 50m grid sqares

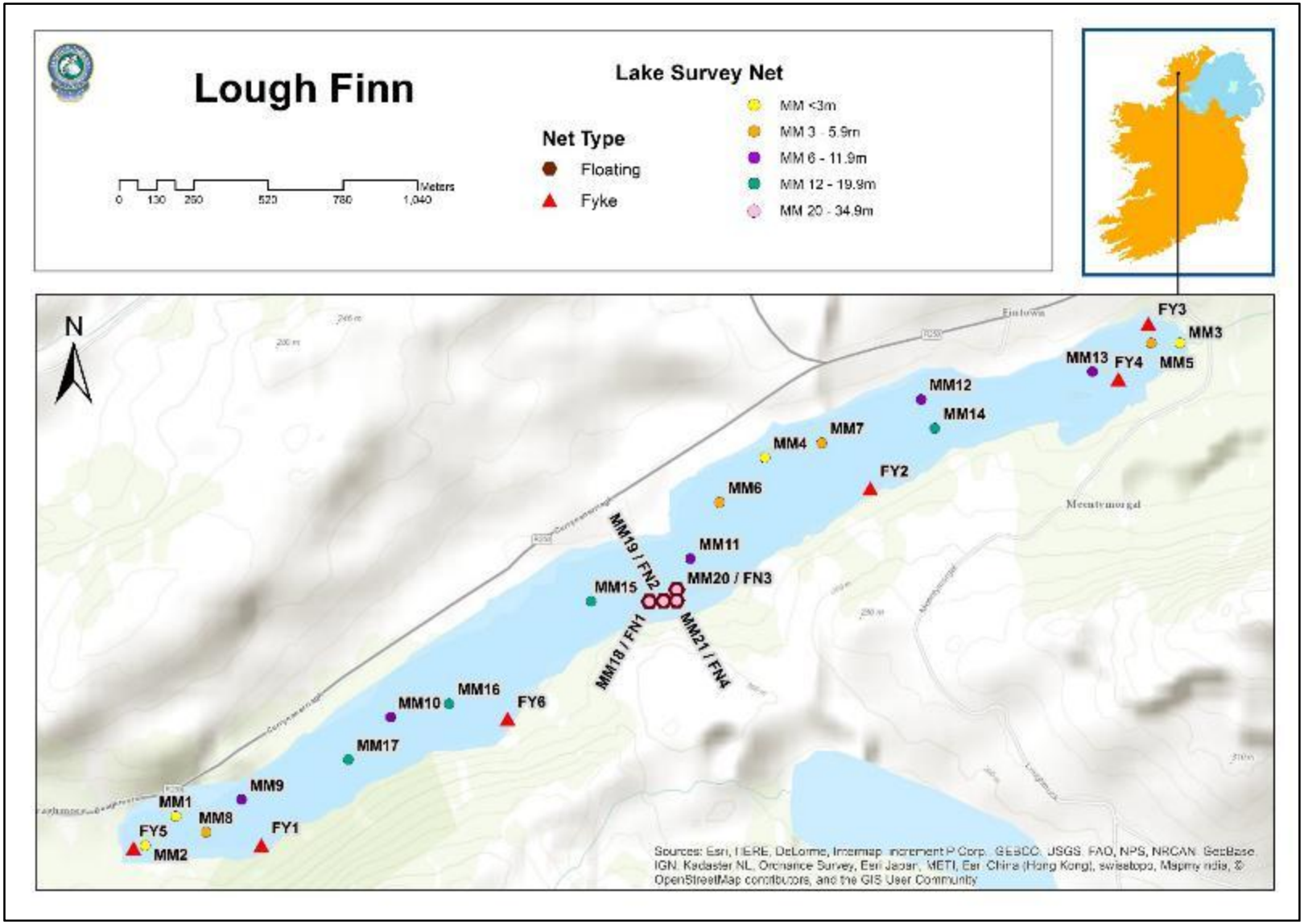


Fig 8. Net locations

## 4.0 RESULTS

### 4.1 SPECIES RICHNESS

A total of 4 fish species were recorded on Lough Finn in September 2017 with a total of 209 fish captured during the survey. A list of all species captured by each gear type is presented in Table 2. Arctic charr one of Irelands rarerest native fish species was recorded with 23 captured during this survey. Brown trout were the most common fish species encountered in the benthic gill nets. All eels apart from 1 were captured in the fyke nets. A total of 13 minnows were also captured.

| Common Name | Scientific Name | Benthic Gill Nets | Fyke Nets | Pelagic Gill Nets | Total |
|---|---|---|---|---|---|
| Brown trout | *Salmo trutta* | 138 | 8 | 0 | **146** |
| Arctic Charr | *Salvelinus alpinus* | 23 | 1 | 4 | **28** |
| European Eel | *Anguilla anguilla* | 1 | 21 | 0 | **22** |
| Minnow | *Phoxinus phoxinus* | 10 | 3 | 0 | **13** |

Table 2. Number of each species captured by each gear type during the survey of Lough Finn, 2017.

### 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 CPUE/BPUE is based on all nets including fyke nets. 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 and 11 below.

Brown trout were the dominant fish species in terms of abundance and also in terms of biomass. Arctic Charr were much lower in terms of abundance and also in terms of biomass as shown below in Table 3.

| Common name | Scientific name | 2017 CPUE | 2017 BPUE |
|---|---|---|---|
| Brown Trout | *Salmo trutta* | **0.157** (0.042) | **11.741** (3.345) |
| Arctic Charr | *Salvelinus alpinus* | **0.029** (0.010) | **1.874** (0.620) |
| European Eel | *Anguilla anguilla* | **0.122** (0.031) | **15.767** (4.782) |
| Minnow | *Phoxinus phoxinus* | **0.019** (0.009) | **0.019** (0.009) |

Table 3. Mean (± S.E.) CPUE and BPUE for all fish species recorded on Lough Finn, 2017.

Fig 9. Arctic charr and brown trout from Lough Finn

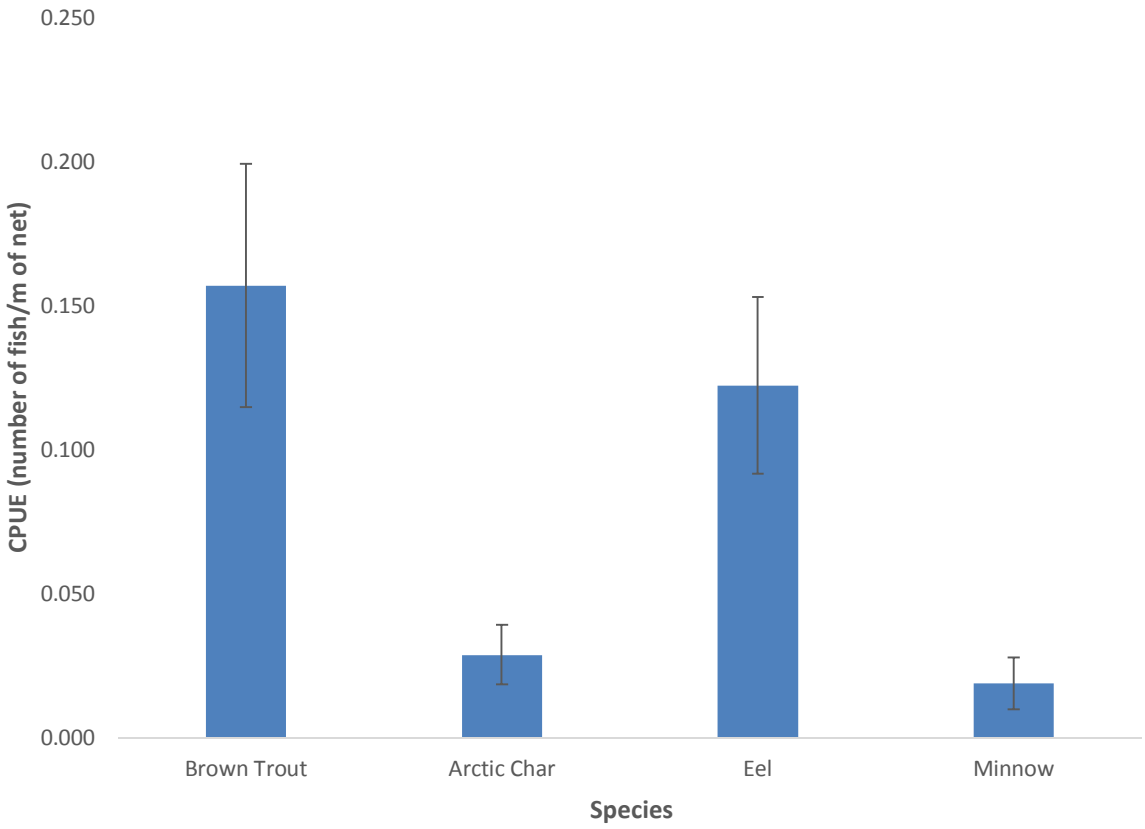


Fig 10. Mean CPUE for all fish species captured in Lough Finn, 2017.

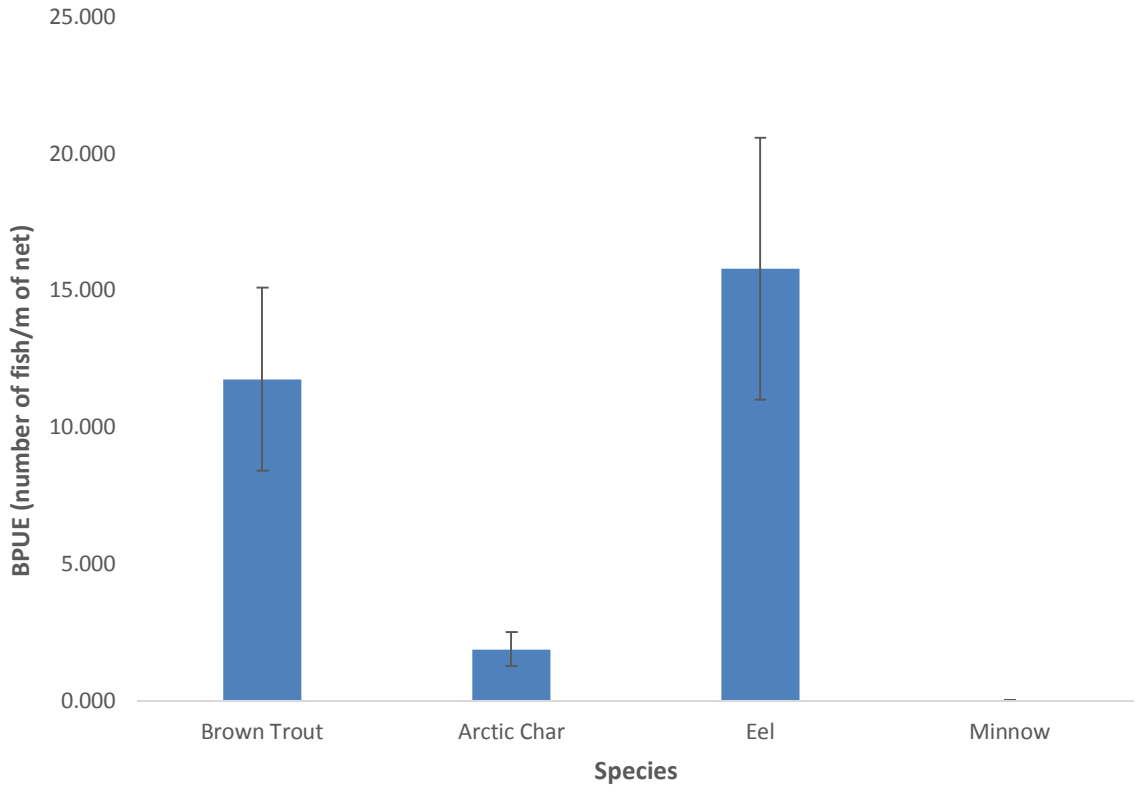


Fig 11. Mean BPUE for all fish species captured in Lough Finn, 2017.

## 4.3 BROWN TROUT STOCK DENSITY & POPULATION STRUCTURE

The relative density (CPUE & BPUE) and length frequency distribution of Brown trout is presented below in Figures 12, 13, 14 & 15. Values are also compared with other lakes which have been surveyed within the Foyle and Carlingford areas. A total of 146 Brown trout were recorded during the Lough Finn survey, lengths ranged from 60mm to 299mm (mean length 186mm). The abundance of Brown trout in Lough Finn is significantly higher than many other surveyed loughs. Eight Brown trout were recorded in Lough Fad East (2017), lengths ranged from 170mm to 450mm (mean length 277mm). Forty four Brown trout were recorded in Lough Muck (Donegal) 2012, lengths ranged from 69mm to 212mm (mean length 168mm). Eighteen Brown trout were recorded in Lough Alaan 2013, lengths ranged from 134mm to 314mm (mean length 234mm). Three Brown trout were recorded in Lough Carn 2010, lengths ranged from 389mm to 422mm (mean length 406mm). Twenty five Brown trout were recorded in Lough Ash 2011, lengths ranged from 297mm to 421mm (mean length 343mm). Two Brown trout were recorded in Lough Mourne 2010, lengths ranged from 205mm to 220mm (mean length 213mm). Fifety nine Brown trout were recorded in Lough Nambradden 2014, lengths ranged from 55mm to 240mm (mean length 147mm).

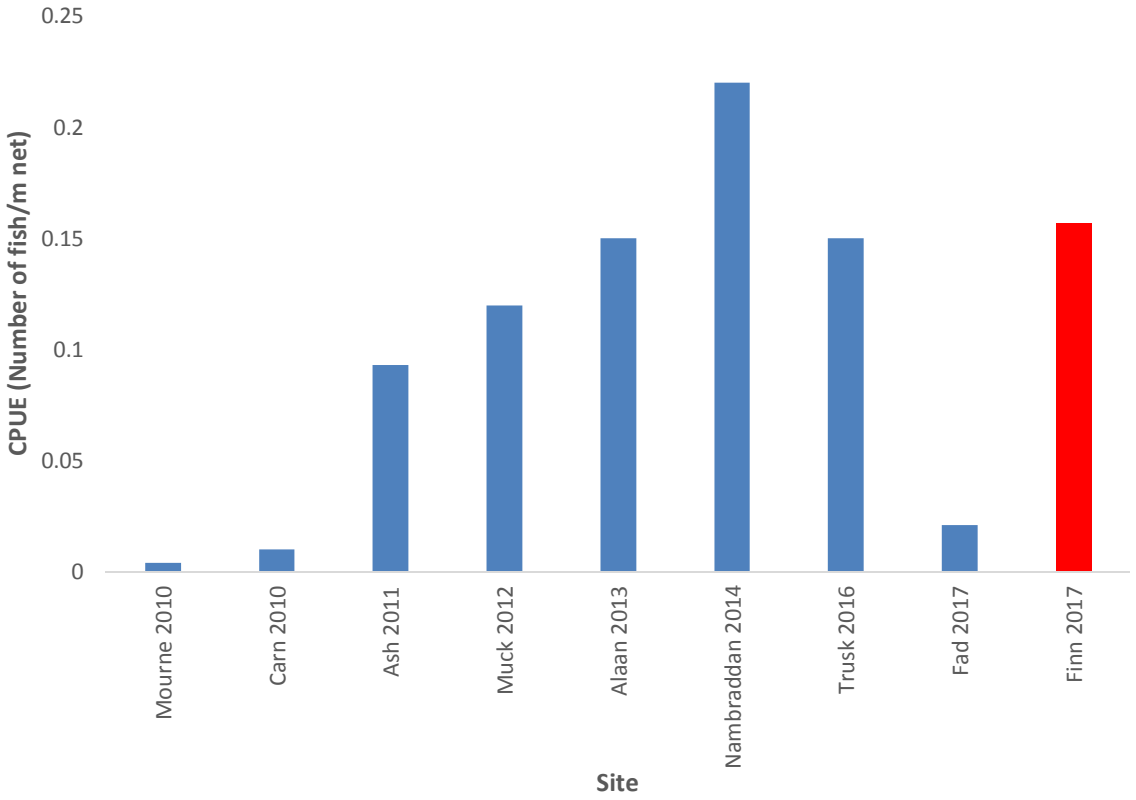


Fig 12. Mean CPUE for all Brown Trout across sampled loughs

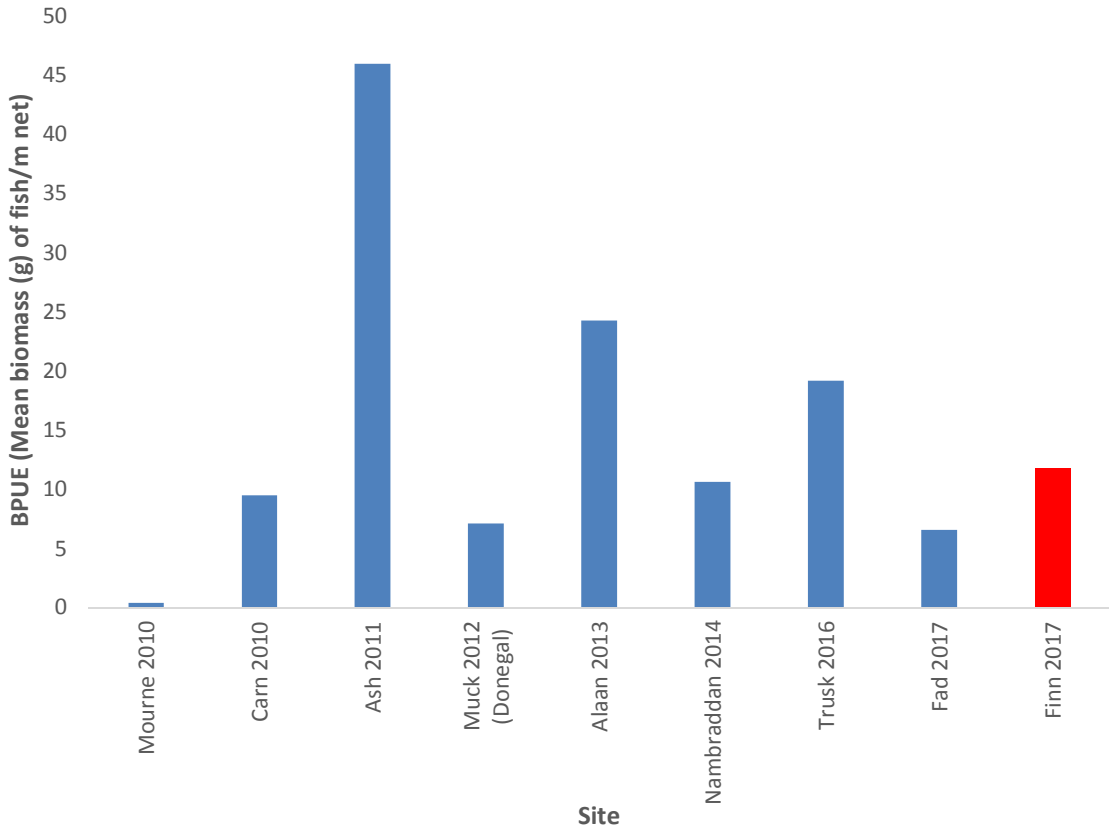


Fig 13. Mean BPUE for all Brown Trout captured across sampled loughs

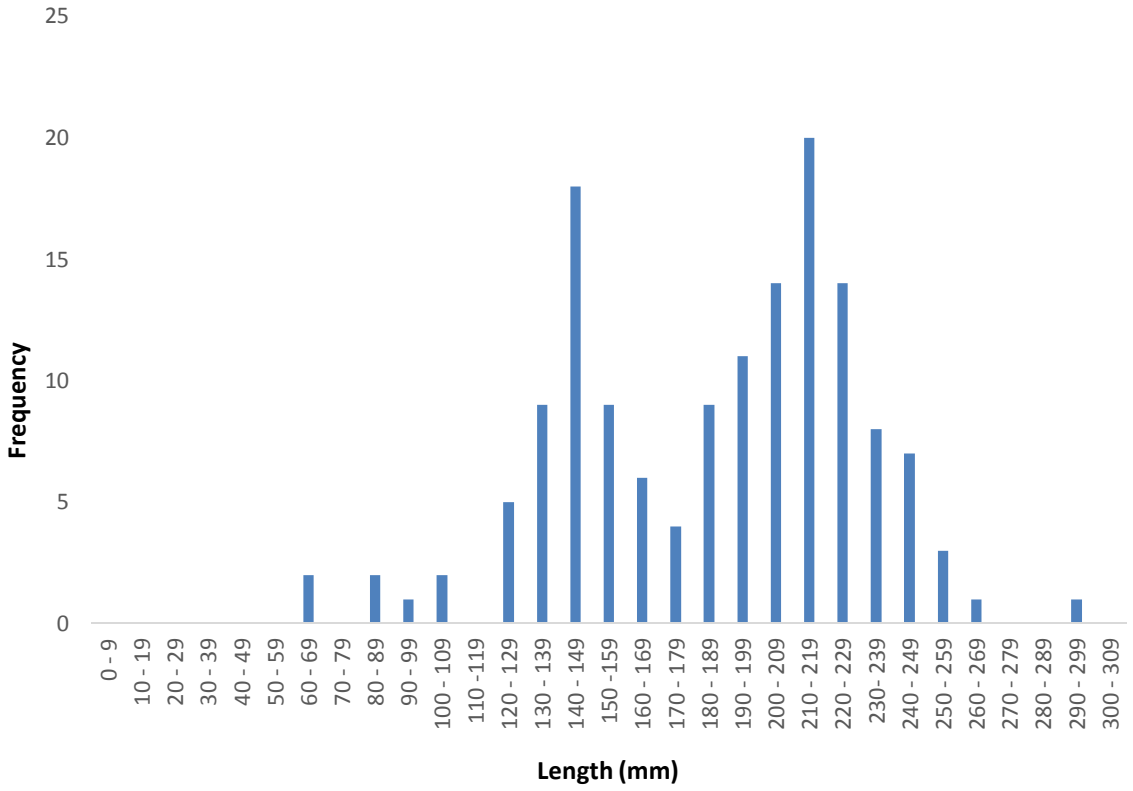


Fig 14. Length frequency Brown Trout, Lough Finn 2017 (N=146)

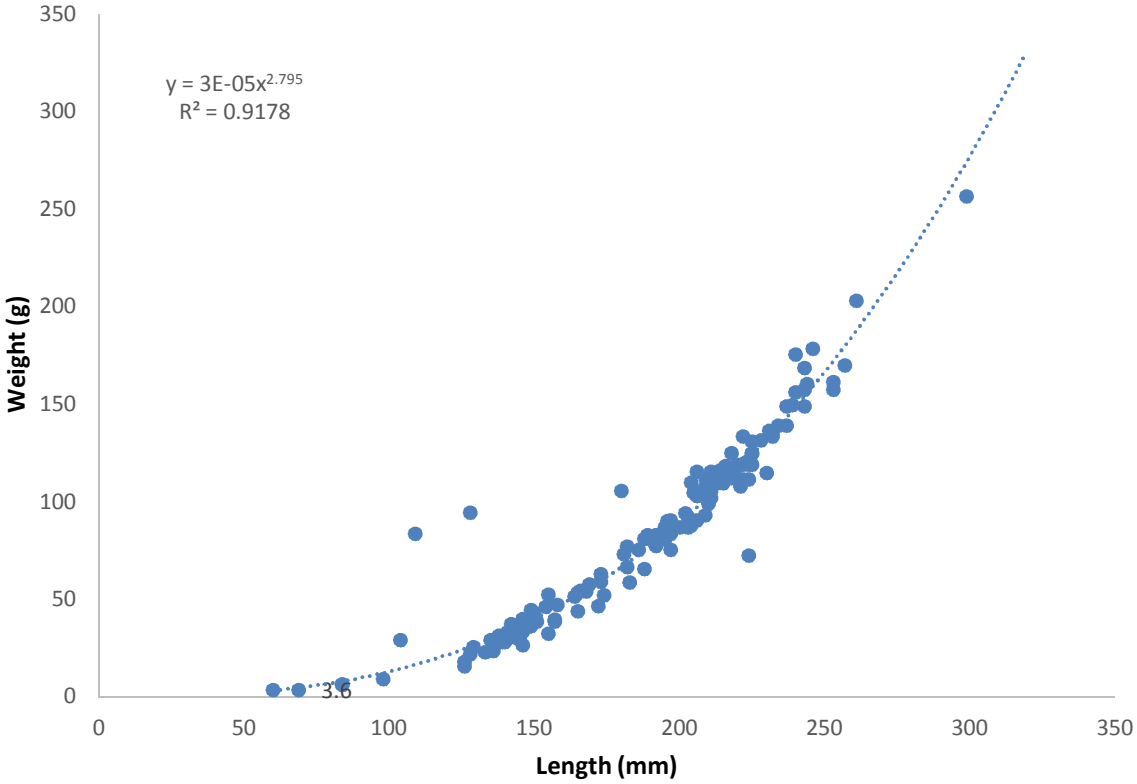


Fig 15. Length weight relationship of Brown Trout, Lough Finn 2017 (n=146)

## 4.4 ARCTIC CHARR STOCK DENSITY & POPULATION STRUCTURE

The relative density (CPUE & BPUE) and length frequency distribution of Arctic Charr is presented below in Figures 16, 17, 18 & 19. A total of 28 Arctic Charr were recorded in Lough Finn, lengths ranged from 60mm to 214mm (mean length 175mm). Values for Arctic Charr are compared with results from Lough Fad East which was also sampled in 2017 and contained Charr.

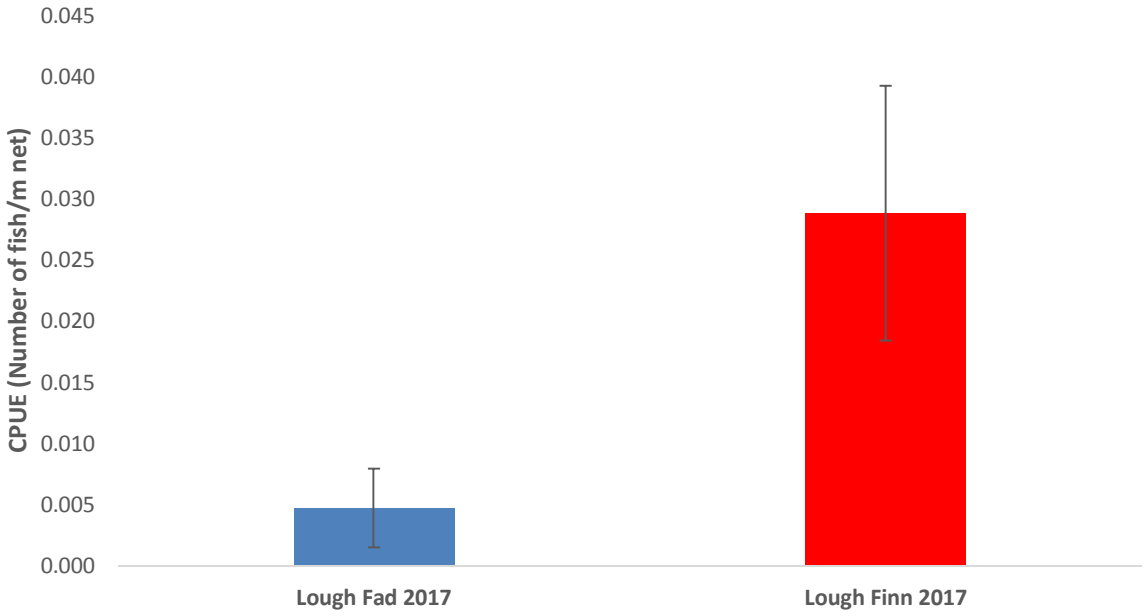


Fig 16. Mean CPUE for all Arctic Charr captured in Lough Fad East 2017 and Lough Finn (2017).

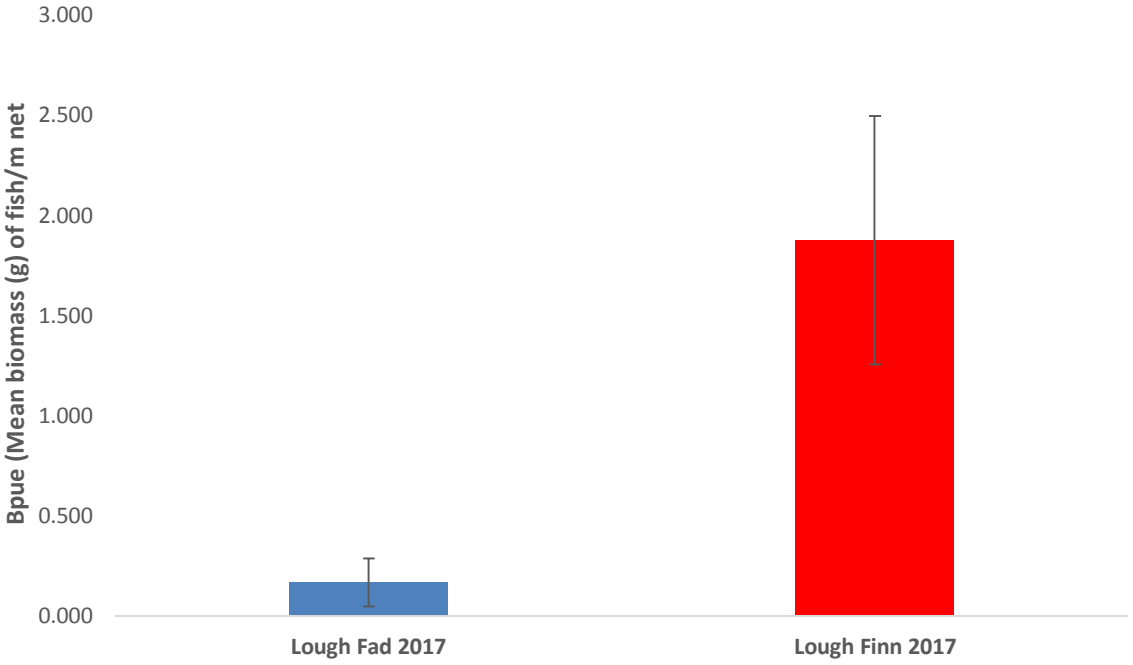


Fig 17. Mean BPUE for all Arctic Charr captured in Lough Fad East 2017 and Lough Finn (2017).

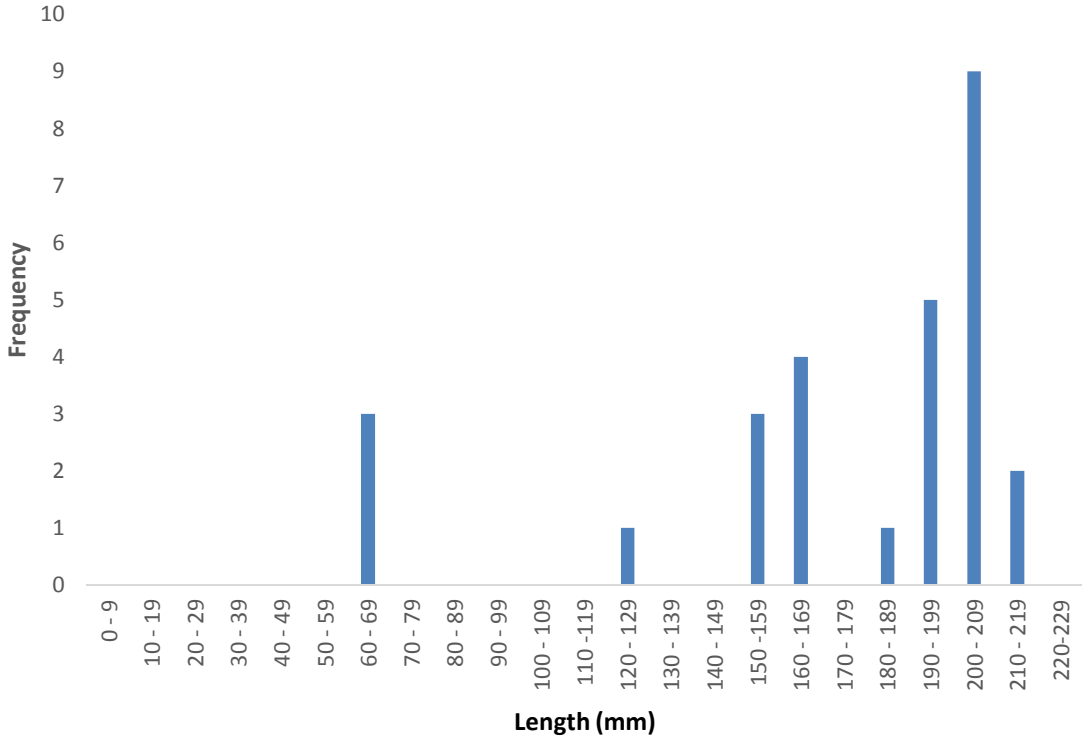


Fig 18. Length frequency of Arctic Charr, Lough Finn 2017 (n=27)

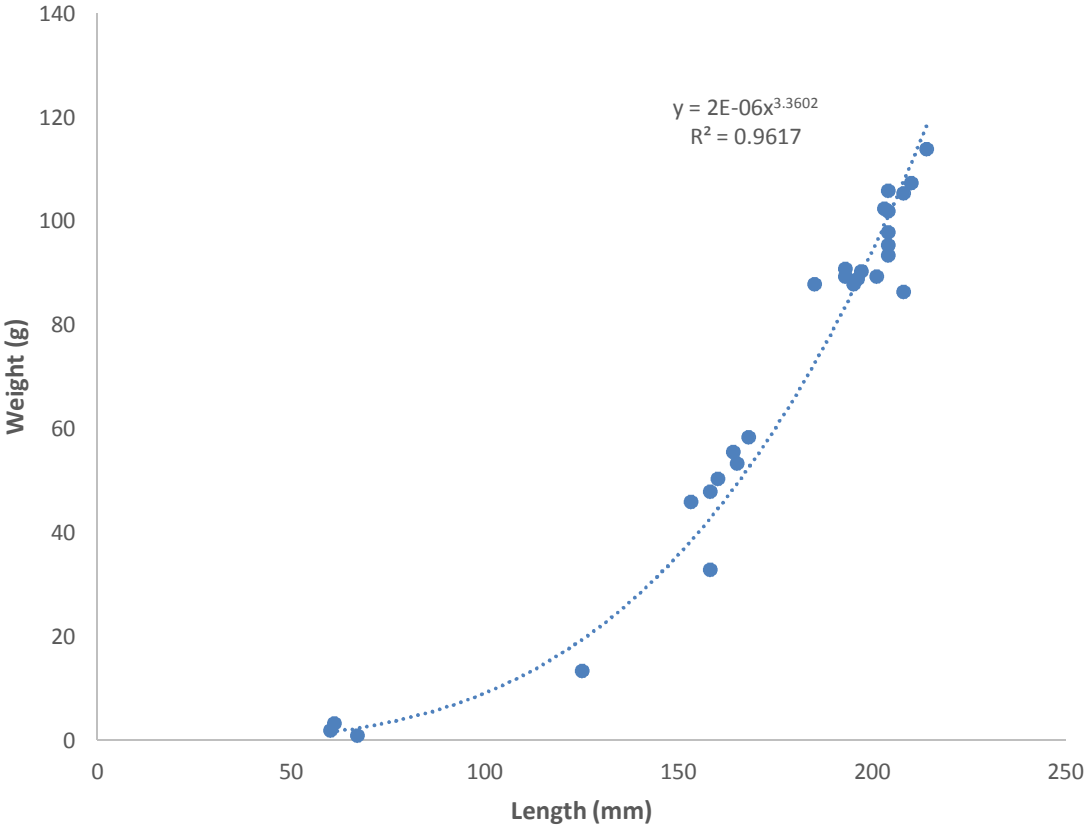


Fig 19. Length weight relationship of Arctic Charr, Lough Finn 2017 (n=27)

## 4.6 EEL STOCK DENSITY AND POPULATION STRUCTURE

The relative density (CPUE & BPUE) and length frequency distribution of Eels is presented below. A total of 23 Eels were recorded in Lough Finn, lengths ranged from 32.5cm – 53.5cm. Values are also compared with other lakes which have been surveyed within the Foyle and Carlingford areas.

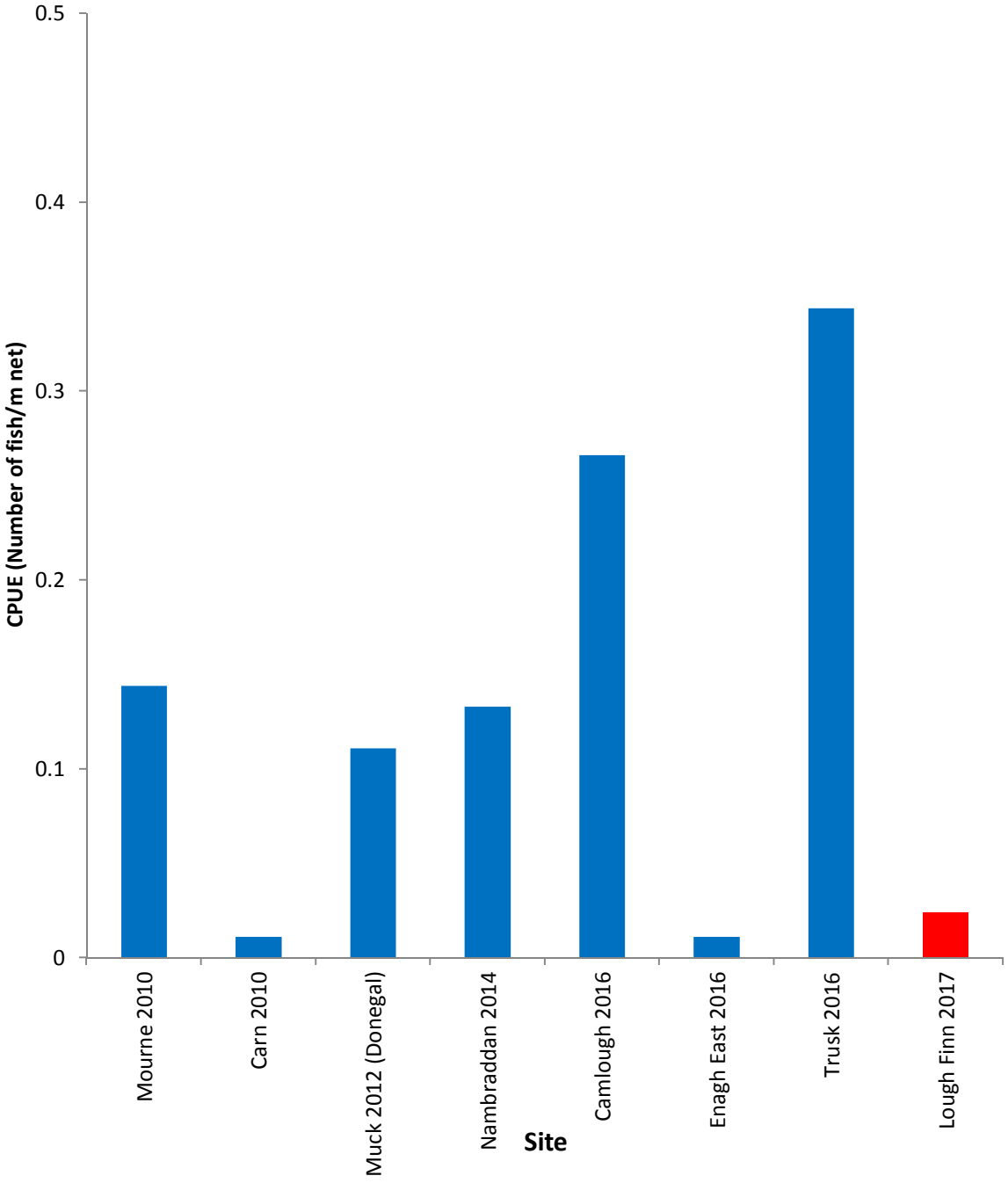


Fig 20. Mean CPUE for Eels, Lough Mourne 2010, Carn 2010, Lough Muck 2012, Nambraddan 2014, Camlough 2016, Enagh East 2016, Trusk 2016 and Lough Finn 2017.

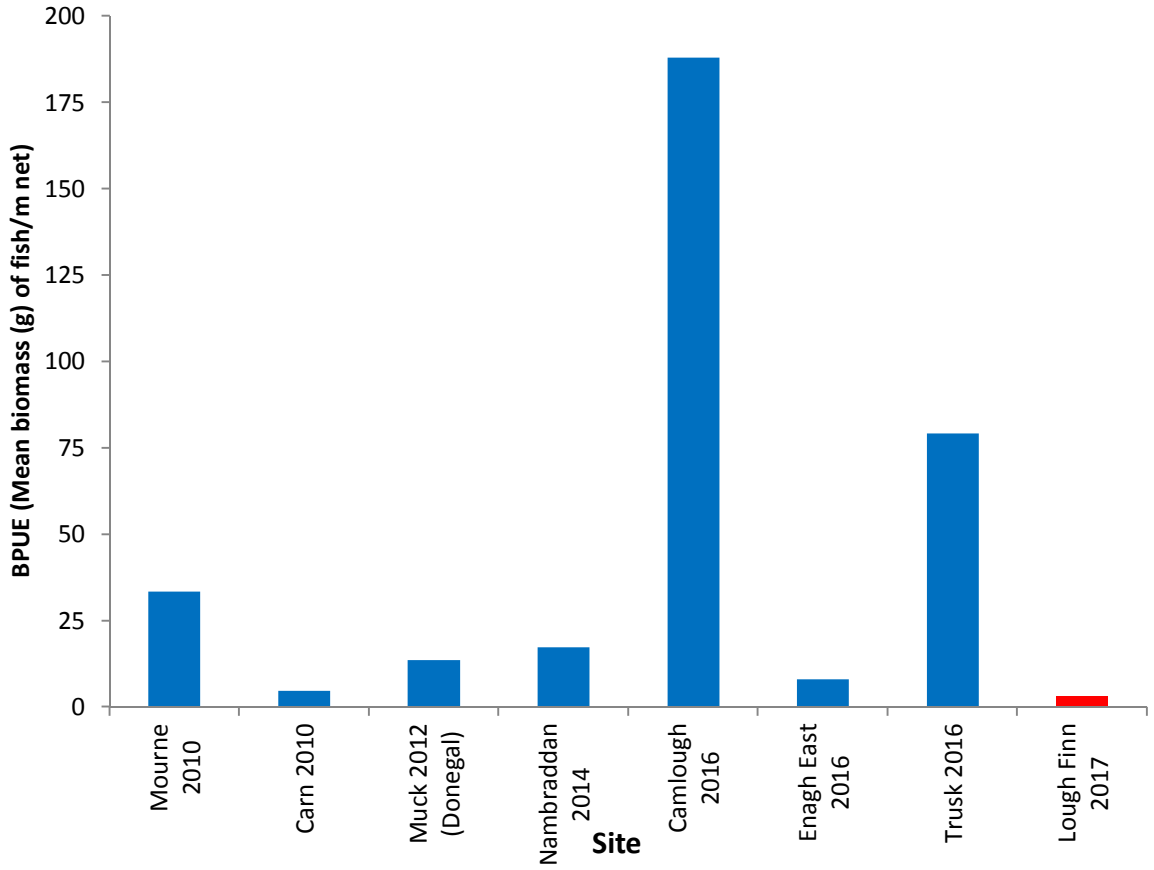


Fig 21. Mean CPUE for Eels, Lough Mourne 2010, Carn 2010, Lough Muck 2012, Nambraddan 2014, Camlough 2016, Enagh East 2016, Trusk 2016 and Lough Finn 2017.

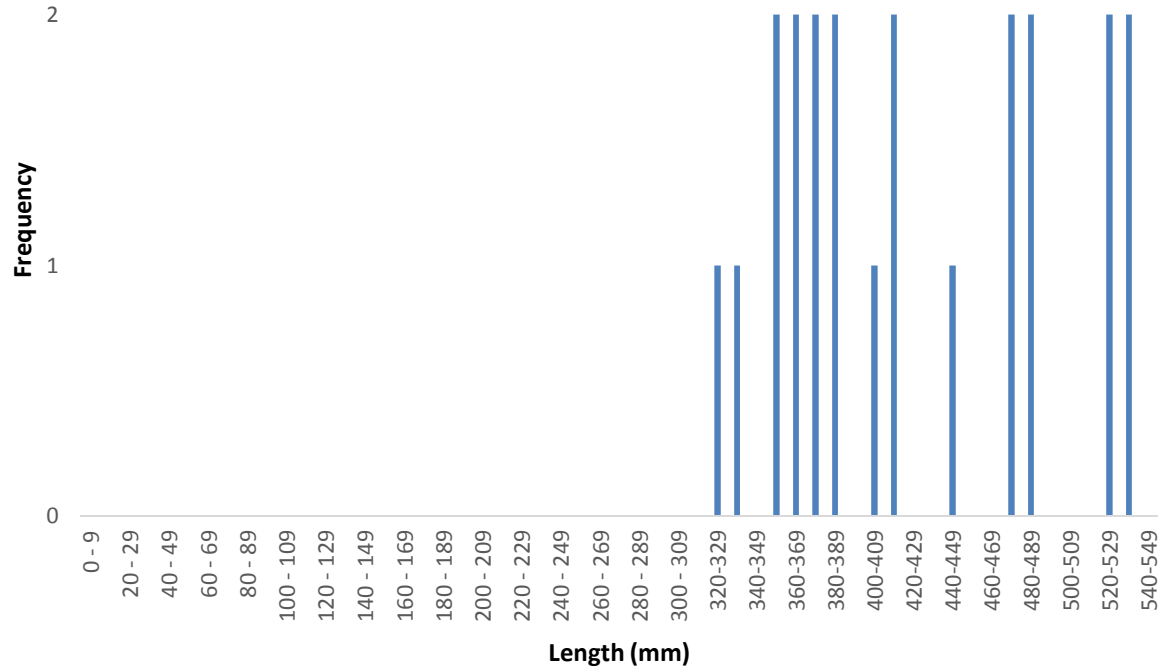


Fig 22. Length frequency for European Eel, Lough Finn 2017 (n=22)

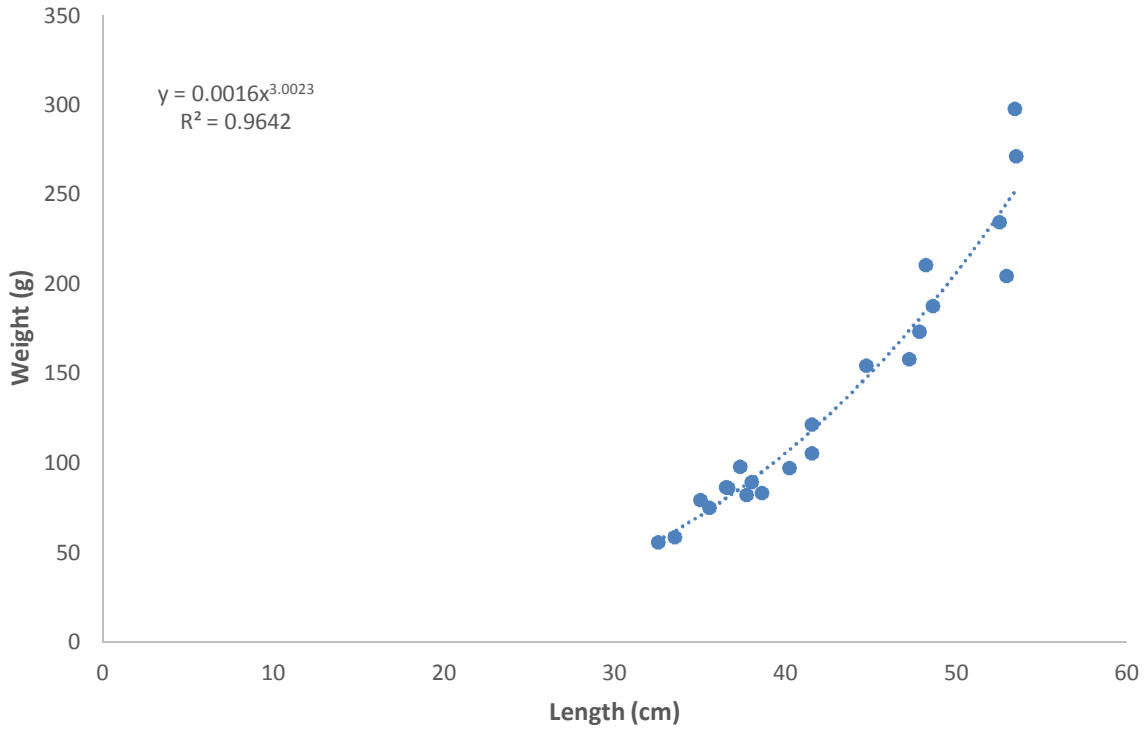


Fig 23. Length weight relationship of European Eel, Lough Finn 2017 (n=22)

| 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 |
| Lough Trusk 2016 | *31* | 442 mm | 230 g |
| Lough Finn 2017 | *22* | 424mm | 137g |

Table 4. Eel mean length and mean weight comparison for lakes surveyed 2010 – 2017.

## 4.5 FISH AGE AND GROWTH

Scales were taken from 77 Brown trout and 26 Arctic charr caught during this survey. A sub sample of 32 Brown trout scales and 15 Arctic charr scales were read for fish aging and back calculated growth analysis. Figure 23 below outlines the average length at age for Brown trout caught during the survey and compares them to Brown trout caught in Lough Muck (2012), Lough Nambraddan (2014), Lough Trusk (2016) and Lough Fad East (2017). A range of age classes were present in Lough Finn with the oldest Trout found to be in the 6+ age class.

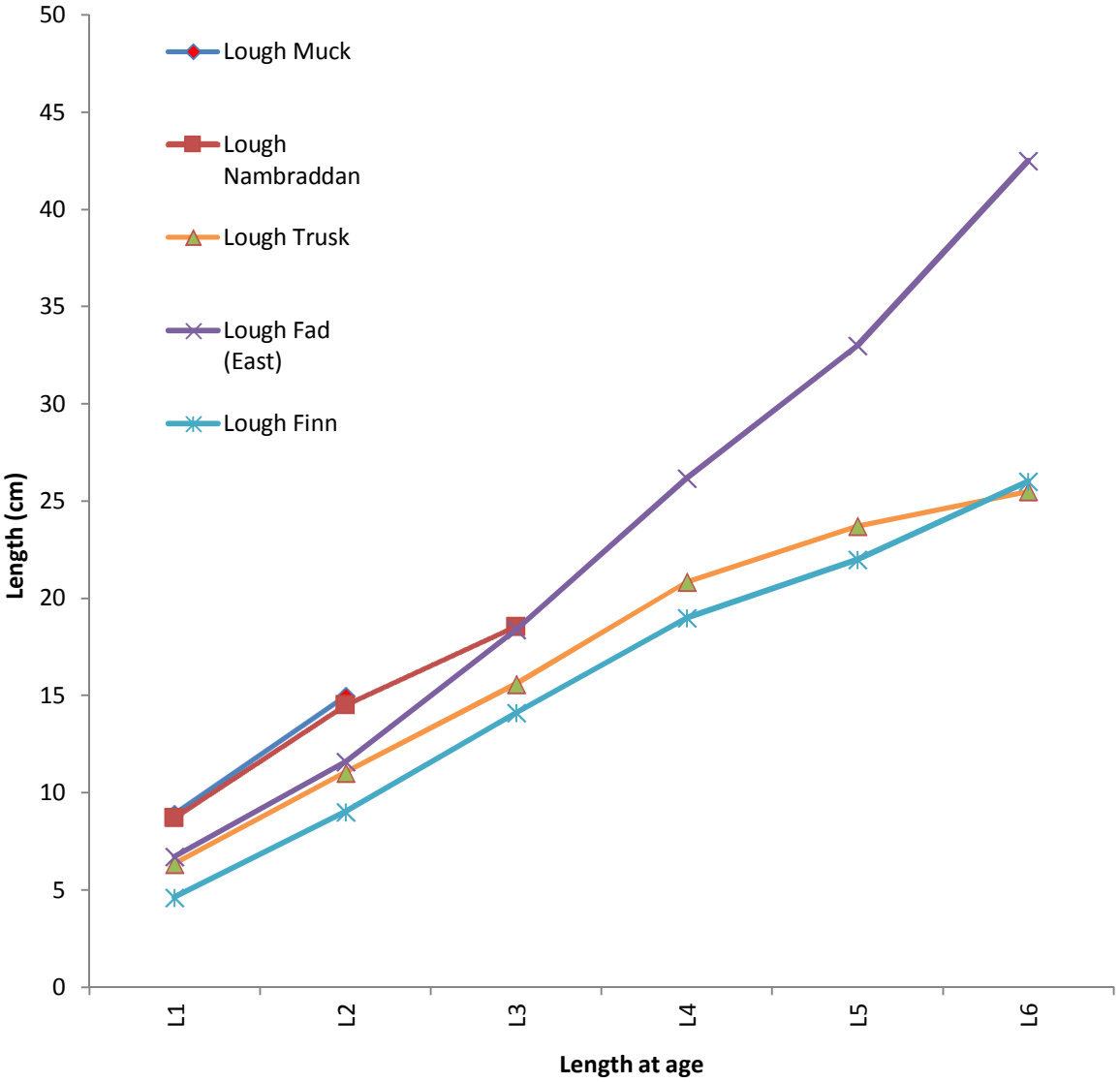


Fig 24. Comparison growth curve showing back calculated length at age for Brown Trout, Lough Muck (2012), Lough Nambraddan (2014), Lough Trusk (2016), Lough Fad East (2017) and Lough Finn (2017).

Figure 25 below shows the average length at age for Arctic Charr caught during the survey. The oldest Arctic charr was found to be in the 4+ age class.

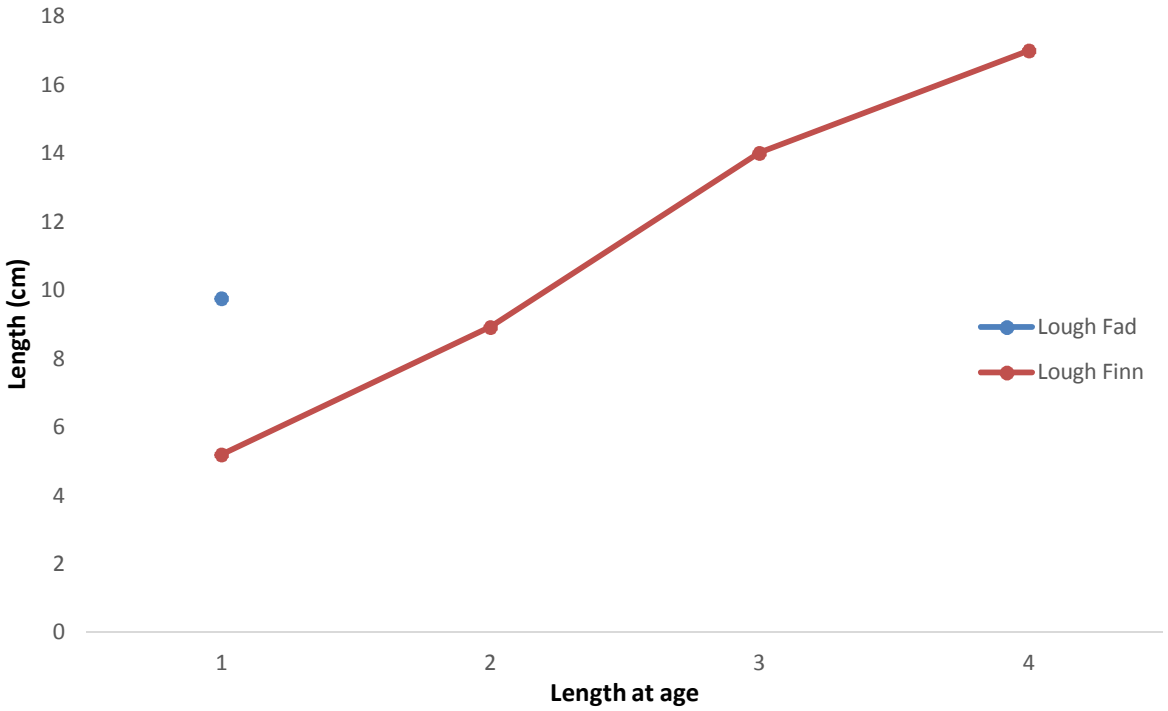


Fig 25. Comparison growth curve showing back calculated length at age for Arctic charr, Lough Fad East (2017) and Lough Finn (2017).

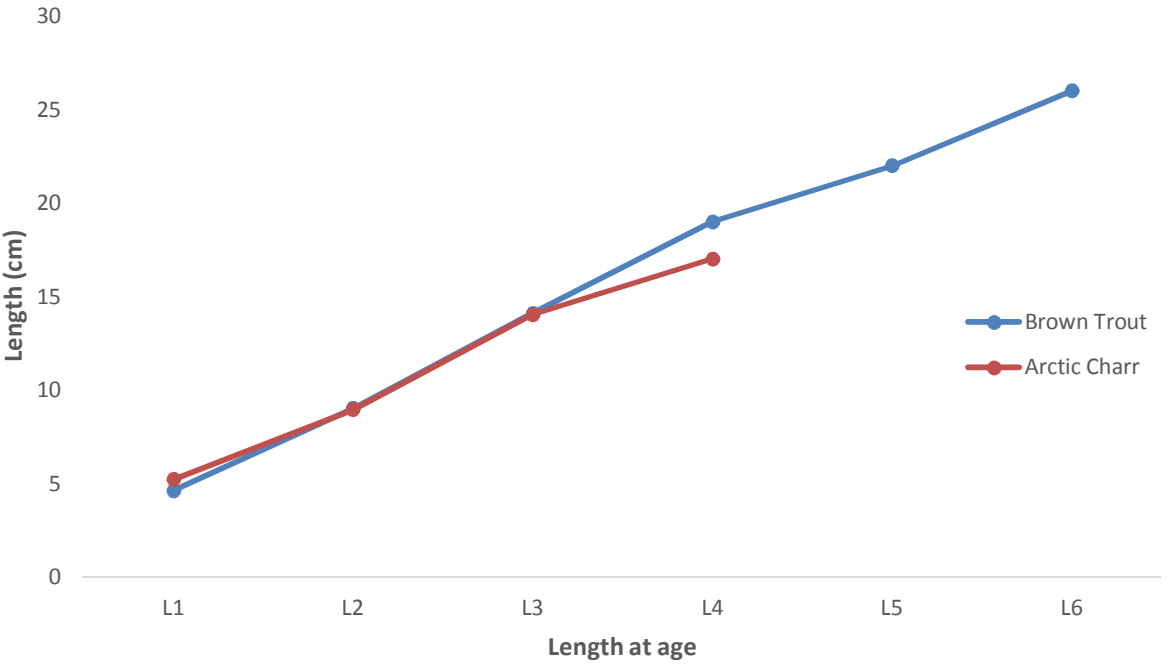


Fig 26. Growth curve showing back calculated length at age comparing Brown Trout and Arctic Charr, Lough Finn (2017).

## 5.0 DISCUSSION

Additional information collected during survey but not reported on here includes water quality data on Dissolved Oxygen, pH, temperature, Total Phophorous and fish stomach content analysis. This information has been retained for future analysis if and when time and resources become available.

Lough Finn is an extremely important lough. It holds a population of nationally rare Arctic charr which as evidenced during the 2017 survey had multiple cohorts present including young of the year. This population appears to be in reasonable condition but further assessment against favourable condition standards would need to be made in order to derive a formal condition assessment.

The population of Brown trout and European eel also appears to be in reasonable condition. A large population of small Brown trout was recorded. No larger specimens were encountered during this survey and a general decline in larger Brown trout caught by local anglers was commented on by local contacts. Larger salmonids have been observed locally at the outflow to Lough Finn at spawning time. It is not known if these fish were Salmon or Trout.

Lough Finn has a small geographical area draining into it and water levels historically where stable. The outflow was dredged a number of years ago and reinstated to a lower level. The reducytion in bed level at the outflow results in water levels running off the lough much faster than previously. This has added to the spate nature of the Finn catchment minimising the natural buffering caopacity offered by Lough Finn on both water chemistry and water levels. Arctic charr may be spawning in the littoral areas and any fluctuations in water levels at sensitive incubation periods have the potential to impact negatively on this population.

## 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

Good biosecurity exists on Lough Finn with boat launching access limited and controlled. A fleet of angling boats are available for rent minimising the pressure to transport boats from other areas which may host invasive species. Additional biosecurity measures should also be encouraged to prevent the spread of invasive non nantive species.

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 Lough Finn fish survey.

## 8.0 RECOMMENDATIONS

- Repeat survey every 5 years.

- Conduct fisheries assessments on the inflowing tributaries to Lough Finn

- Conduct spawning survey/camera deployment/trapping exercise at the outflow to Lough Finn at spawning time

- Investigate the potential for raising the outflow to Lough Finn to align with original bed levels.

- 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

- Liaise with angling associations to develop best practice management advice

## 9.0 REFERENCES

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