



# Sampling Fish for the Water Framework Directive

*Lakes 2012*

**Lough Bunny**



lascach Intíre Éireann  
Inland Fisheries Ireland

## Water Framework Directive Fish Stock Survey of Lough Bunny, September 2012

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## 1.1 Introduction

Lough Bunny is located just within the boundary of the Burren National Park, approximately 8km from Corrofin, County Clare (Plate 1.1, Fig. 1.1). The lake is situated in the “East Burren Complex” Special Area of Conservation; a large area that encompasses all of the high ground in the east Burren. A total of 12 different habitats listed on Annex I of the EU Habitats Directive exist within the SAC, including areas of limestone pavement, calcareous grasslands, heath scrub, woodlands and calcareous lakes and turloughs (NPWS, 2001). The site exhibits some of the best and most extensive areas of oligotrophic limestone wetlands to be found in the Burren and in Europe. Some of the most extensive calcareous swamp fen communities in the country occur within this complex and especially around the shores of Lough Bunny. The shores of the lough are home to a number of important bird species (NPWS, 2001). The area also contains some ecologically-sensitive habitats, including large areas of alkaline fen (Pybus *et al.*, 2003). Such vegetation is in serious decline in Europe and has been included in Annex I of the Habitats Directive (CEC, 1992).

Lough Bunny is a permanent lake and is believed to have been formed by the localised collapse of the underlying bedrock (Ragneborn-Tough *et al.*, 1999). The surrounding geology of the lake is composed of Upper Carboniferous limestone. Most of the lakes to the south of Lough Bunny are connected to the River Fergus by small streams; however, Lough Bunny has no permanent over ground inflow or outflow. It is fed from springs and drains through sinkholes at the northern end of the lake (Ragneborn-Tough *et al.*, 1999).

Lough Bunny has a surface area of 102ha, a mean depth of 2.7m and maximum depth of 14m. The lake is categorised as typology class 10 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. shallow (<4m), greater than 50ha and high alkalinity (>100mg/l CaCO<sub>3</sub>).

Surveys conducted by the Inland Fisheries Trust in 1970 and 1980 reported stocks of pike, rudd and perch in the lake. Eels were also reported in the 1970 survey (IFT, 1980; IFI unpublished data).

The lake was also previously surveyed in September 2009 as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al.*, 2010). During this survey, perch were found to be the dominant species present in the lake. Rudd, pike and eels were also captured during the survey.



**Plate 1.1. Lough Bunny**

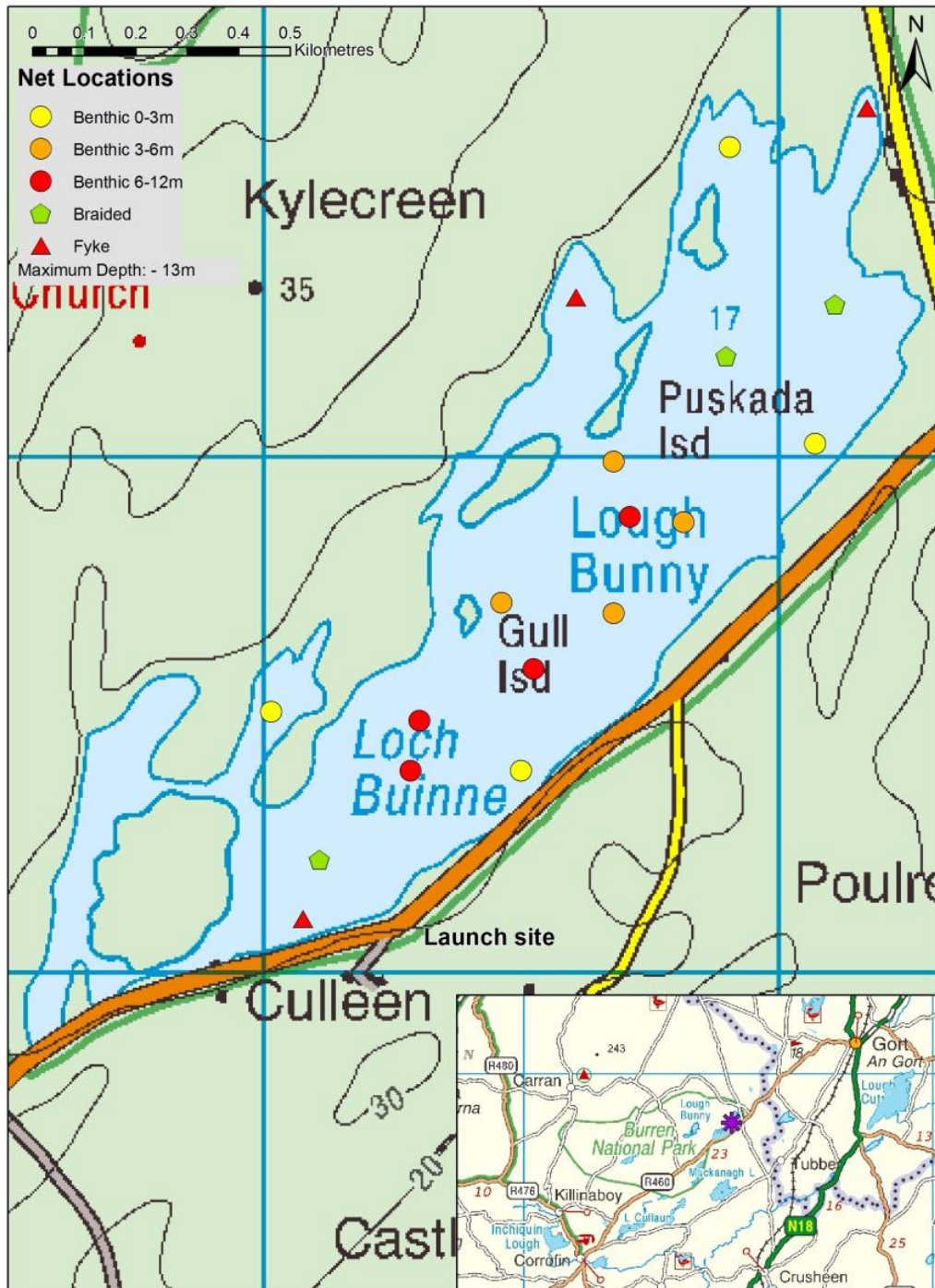


Fig. 1.1. Location map of Lough Bunny showing locations and depths of each net

## 1.2 Methods

Lough Bunny was surveyed over two nights between the 12<sup>th</sup> and the 14<sup>th</sup> September 2012. A total of three sets of Dutch fyke nets and 12 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (4 @ 0-2.9m, 4 @ 3-5.9m and 4 @ 6-11.9m) were deployed randomly in the lake (15 sites). The netting effort was supplemented using three benthic braided survey gill nets (62.5mm mesh knot to knot) at three additional sites. Nets were deployed in the same locations as were randomly selected in the previous survey in 2009. A handheld GPS was used to mark the precise location of each net. The angle of each gill net in relation to the shoreline was randomised.

All fish apart from perch were measured and weighed on site and scales were removed from all rudd and pike. Live fish were returned to the water whenever possible (i.e. when the likelihood of their survival was considered to be good). Samples of fish were returned to the laboratory for further analysis.

## 1.3 Results

### 1.3.1 Species Richness

A total of four fish species were recorded on Lough Bunny in September 2012, with 146 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Perch was the most abundant fish species recorded, followed by rudd, pike and eels. A similar species composition was recorded during the previous survey in 2009 (Kelly *et al.*, 2010).

**Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Bunny, September 2012**

| Scientific name                    | Common name  | Number of fish captured                |                                 |           | Total |
|------------------------------------|--------------|--|---------------------------------|-----------|-------|
|                                    |              | Benthic mono<br>multimesh gill<br>nets | Benthic<br>braided gill<br>nets | Fyke nets |       |
| <i>Perca fluviatilis</i>           | Perch        | 109                                    | 0                               | 1         | 110   |
| <i>Scardinius erythrophthalmus</i> | Rudd         | 29                                     | 0                               | 0         | 29    |
| <i>Esox lucius</i>                 | Pike         | 6                                      | 0                               | 0         | 6     |
| <i>Anguilla anguilla</i>           | European eel | 0                                      | 0                               | 1         | 1     |

### ***1.3.2 Fish abundance***

Fish abundance (mean CPUE) and biomass (mean BPUE) were calculated as the mean number/weight of fish caught per metre of net. For all fish species except eel, CPUE/BPUE is based on all nets, whereas eel CPUE/BPUE is based on fyke nets only. Mean CPUE and BPUE for all fish species captured in 2009 and 2012 are summarised in Table 1.2. Mean CPUE and BPUE for all fish species is illustrated in Figures 1.2 and 1.3.

Although the mean perch CPUE appeared higher in 2012 than in 2009, this difference was not statistically significant (Fig. 1.2).

The differences in the mean perch CPUE and BPUE between Lough Bunny and six similar lakes was assessed, with overall significant differences being found (Kruskal-Wallis,  $P < 0.05$ ) (Fig. 1.4 and Fig. 1.5). Independent-Samples Mann-Whitney U tests between each lake showed that Lough Bunny had a significantly higher mean perch CPUE and BPUE than Lough Mask ( $z = 2.795$ ,  $P < 0.05$  and  $z = 2.243$ ,  $P < 0.05$ ).

Although the mean perch BPUE appeared slightly lower in 2012 than in 2009, this difference was not statistically significant (Fig. 1.3).

The mean rudd CPUE and BPUE also appeared slightly different in 2012 than in 2009, however these differences were not statistically significant (Fig. 1.2 and Fig. 1.3).

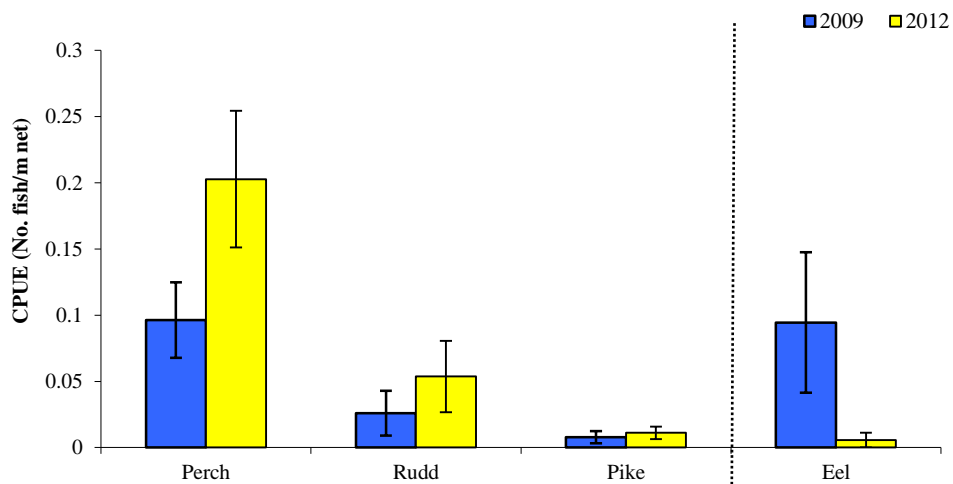
The differences in the mean rudd CPUE and BPUE between Lough Bunny and six similar lakes was assessed, with overall significant differences being found (Kruskal-Wallis,  $P < 0.05$ ) (Fig. 1.6 and Fig. 1.7). Independent-Samples Mann-Whitney U tests between each lake showed that Lough Bunny had a significantly lower mean rudd CPUE and BPUE than Lough Gur ( $P < 0.05$ ).



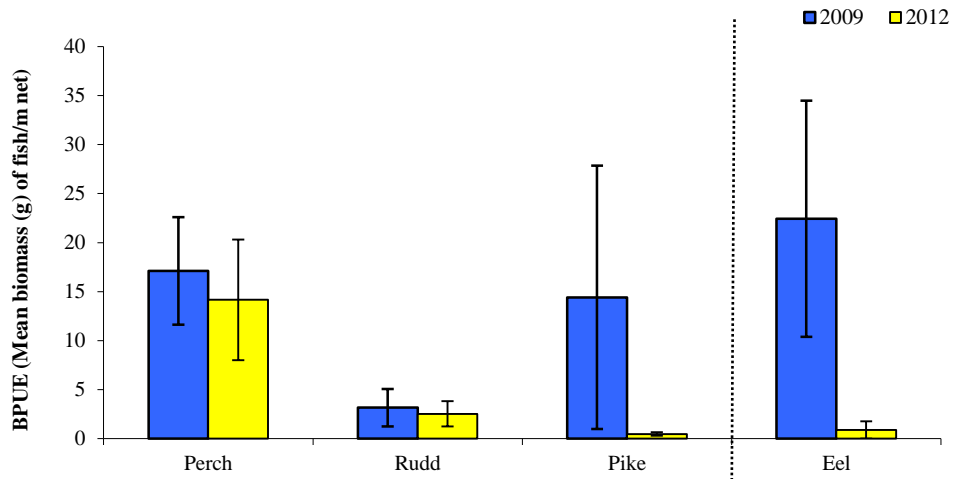
**Table 1.2 Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Bunny, 2009 and 2012**

| Scientific name                    | Common name  | 2009            | 2012           |
|------------------------------------|--------------|-----------------|----------------|
| <b>Mean CPUE</b>                   |              |                 |                |
| <i>Perca fluviatilis</i>           | Perch        | 0.096 (0.028)   | 0.203 (0.052)  |
| <i>Scardinius erythrophthalmus</i> | Rudd         | 0.026 (0.017)   | 0.054 (0.027)  |
| <i>Esox lucius</i>                 | Pike         | 0.008 (0.005)   | 0.011 (0.005)  |
| <i>Anguilla anguilla</i>           | European eel | 0.094 (0.053)   | 0.006 (0.006)  |
| <b>Mean BPUE</b>                   |              |                 |                |
| <i>Perca fluviatilis</i>           | Perch        | 17.107 (5.495)  | 14.157 (6.149) |
| <i>Scardinius erythrophthalmus</i> | Rudd         | 3.156 (1.916)   | 2.519 (1.279)  |
| <i>Esox lucius</i>                 | Pike         | 14.405 (13.446) | 0.458 (0.185)  |
| <i>Anguilla anguilla</i>           | European eel | 22.433 (12.057) | 0.878 (0.878)  |

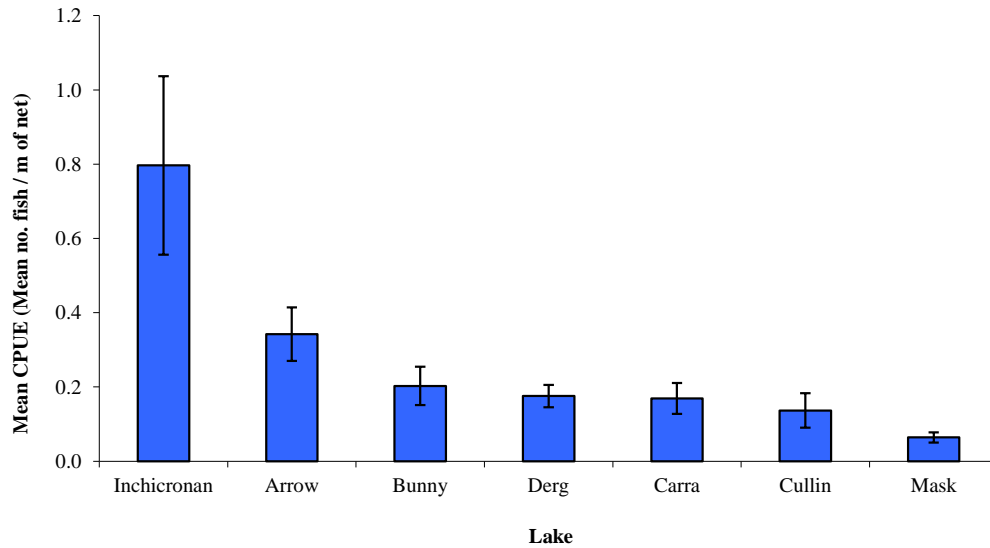
\* On the rare occasion where biomass data was unavailable for an individual fish, this was determined from a length/weight regression for that species.



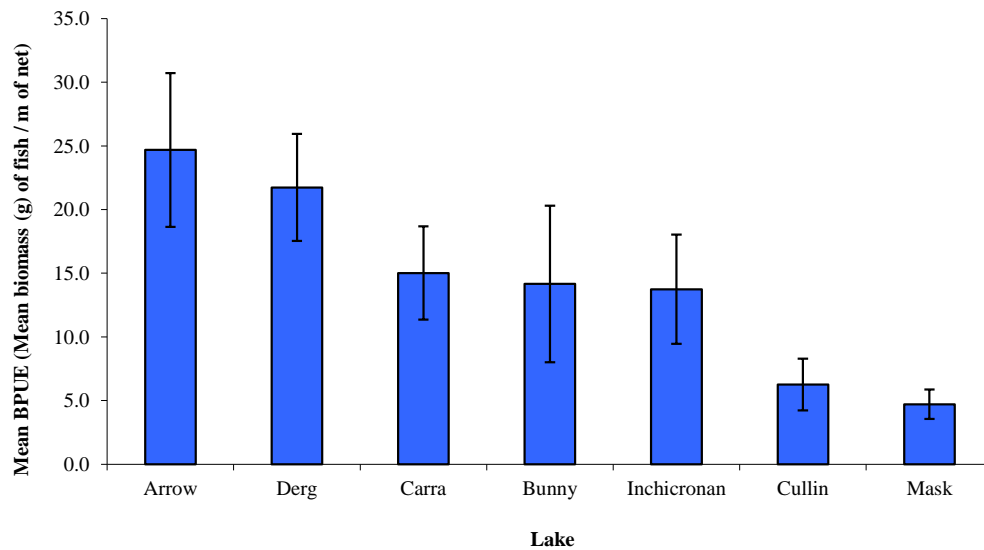
**Fig. 1.2 Mean ( $\pm$ S.E.) CPUE for all fish species captured in Lough Bunny (Eel CPUE based on fyke nets only), 2009 and 2012**



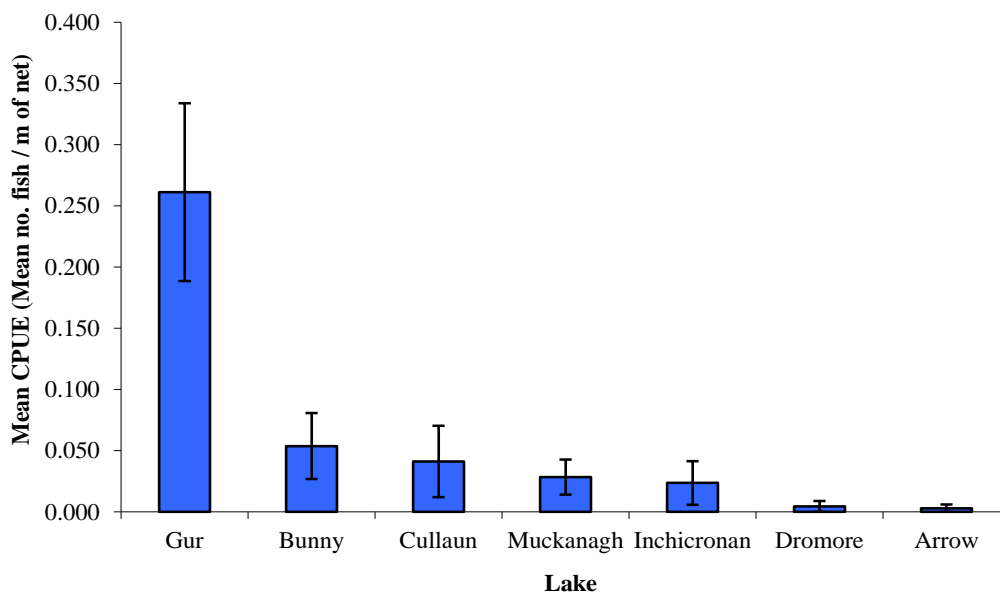
**Fig. 1.3 Mean ( $\pm$ S.E.) BPUE for all fish species captured in Lough Bunny (Eel BPUE based on fyke nets only), 2009 and 2012**



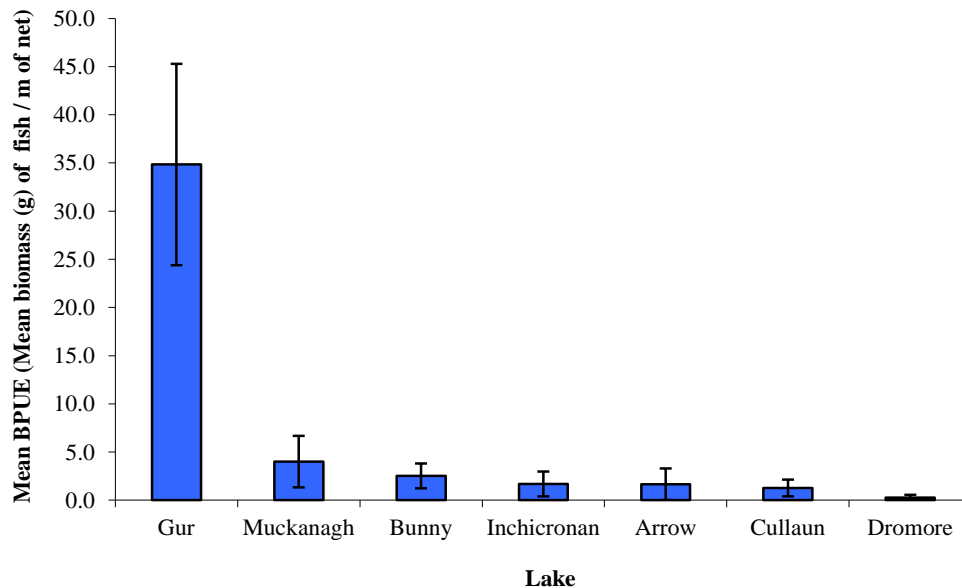
**Fig. 1.4 Mean ( $\pm$ S.E.) perch CPUE in seven lakes surveyed during 2012**



**Fig. 1.5 Mean ( $\pm$ S.E.) perch BPUE in seven lakes surveyed during 2012**



**Fig. 1.6. Mean ( $\pm$ S.E.) rudd CPUE in seven lakes surveyed during 2012**



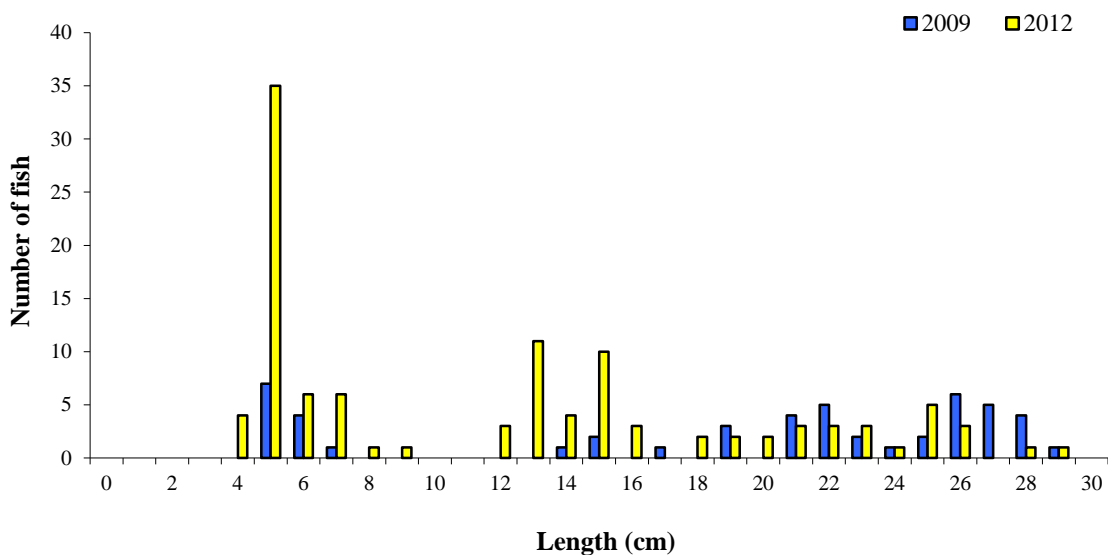
**Fig. 1.7. Mean ( $\pm$ S.E.) rudd BPUE in seven lakes surveyed during 2012**

### *1.3.3 Length frequency distributions*

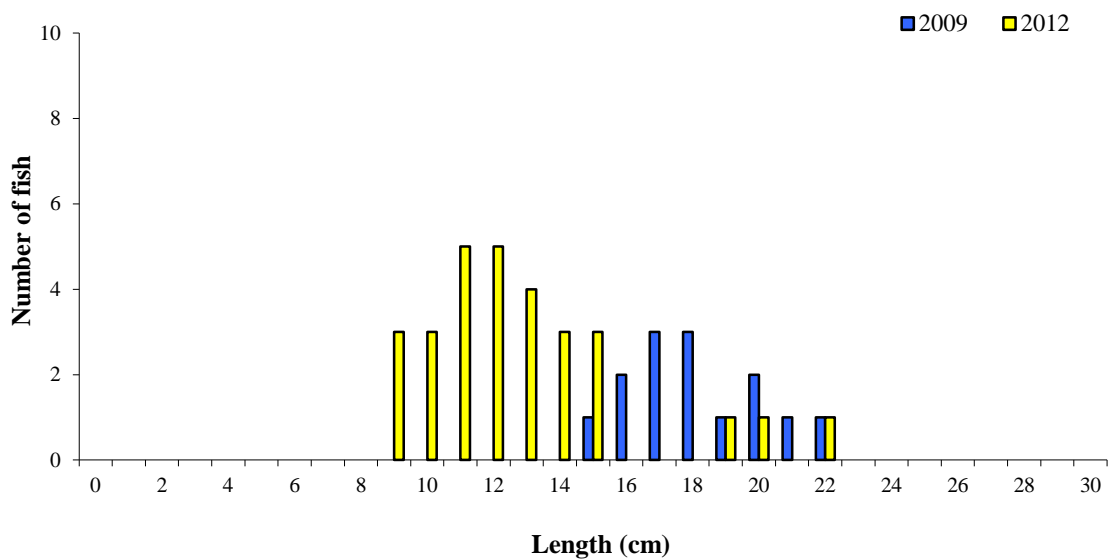
Perch captured during the 2012 survey ranged in length from 4.8cm to 29.0cm (mean = 12.4cm) (Fig. 1.6). Perch captured during the 2009 survey ranged in length from 5.3cm to 29.1cm (Fig. 1.6).

Rudd captured during the 2012 survey ranged in length from 9.2cm to 22.6cm (mean = 13.1cm) (Fig. 1.7). Rudd captured during the 2009 survey ranged in length from 15.0cm to 22.5cm (Fig. 1.7).

Pike captured during the 2012 survey ranged in length from 16.0cm to 20.5cm and one eel was recorded at 44.8cm.



**Fig. 1.6 Length frequency of perch captured on Lough Bunny, 2009 and 2012**



**Fig. 1.7 Length frequency of rudd captured on Lough Bunny, 2009 and 2012**

### 1.3.4 Fish age and growth

Seven age classes of perch were present, ranging from 0+ to 6+, with a mean L1 of 5.7cm (Table 1.3). The dominant age class was 0+ (Fig 1.6). In the 2009 survey, perch ranged from 0+ to 4+ with a mean L1 of 7.2cm.

Four age classes of rudd were present, ranging from 1+ to 6+, with a mean L1 of 2.0cm (Table 1.4). The dominant age class was 2+ (Fig 1.7). In the 2009 survey, rudd ranged from 3+ to 5+ with a mean L1 of 2.6cm.

Pike captured were all aged at 0+ during the 2012 survey.

**Table 1.3 Mean ( $\pm$ SE) perch length (cm) at age for Lough Bunny, September 2012**

|       | <b>L<sub>1</sub></b> | <b>L<sub>2</sub></b> | <b>L<sub>3</sub></b> | <b>L<sub>4</sub></b> | <b>L<sub>5</sub></b> | <b>L<sub>6</sub></b> |
|-------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Mean  | 5.7 (0.1)            | 13.3 (0.3)           | 18.5 (0.5)           | 21.3 (1.2)           | 22.9 (0.6)           | 24.9 (0)             |
| N     | 50                   | 25                   | 17                   | 6                    | 4                    | 1                    |
| Range | 3.3-7.8              | 10.0-16.9            | 13.8-21.7            | 16.5-25.6            | 21.2-23.7            | 24.9-24.9            |

**Table 1.4 Mean ( $\pm$ SE) rudd length (cm) at age for Lough Bunny, September 2012**

|       | <b>L<sub>1</sub></b> | <b>L<sub>2</sub></b> | <b>L<sub>3</sub></b> | <b>L<sub>4</sub></b> | <b>L<sub>5</sub></b> | <b>L<sub>6</sub></b> |
|-------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Mean  | 2.0 (0.1)            | 5.3 (0.2)            | 9.6 (0.3)            | 15.3 (0.4)           | 17.9 (0.5)           | 19.9 (0)             |
| N     | 28                   | 28                   | 16                   | 3                    | 3                    | 1                    |
| Range | 1.3-4.4              | 4.0-8.2              | 8.4-12.1             | 14.8-16.0            | 17.0-18.8            | 19.9-19.9            |

## 1.4 Summary

Perch was the dominant species in terms of abundance (CPUE) and biomass (BPUE) captured in the survey gill nets.

Although the mean perch CPUE and BPUE in Lough Bunny appeared slightly different in 2012 than in the 2009 survey, these differences were not statistically significant. The mean perch CPUE and BPUE in Lough Bunny was significantly higher than Lough Mask, another similar lake surveyed. Perch ranged in age from 0+ to 6+, indicating reproductive success in the previous seven years.

The mean rudd CPUE and BPUE in Lough Bunny also appeared slightly different in 2012 than in the 2009 survey, however these differences were not statistically significant. The mean rudd CPUE and BPUE in Lough Bunny was significantly lower than Lough Gur, another similar lake surveyed. Rudd ranged in age from 1+ to 6+, indicating reproductive success in four of the previous seven years.

Classification and assigning lakes with an ecological status is a critical part of the WFD monitoring programme. It allows River Basin District managers to identify and prioritise lakes that currently fall short of the minimum “Good Ecological Status” that is required by 2015 if Ireland is not to incur penalties.

A multimetric fish ecological classification tool (Fish in Lakes – ‘FIL’) was developed for the island of Ireland (Ecoregion 17) using IFI and Agri-Food and Biosciences Institute Northern Ireland (AFBINI) data generated during the NSSHARE Fish in Lakes project (Kelly *et al.*, 2008). This tool was further developed during 2010 (FIL2) in order to make it fully WFD compliant, including producing EQR values for each lake and associated confidence in classification (Kelly *et al.*, 2012). Using the FIL2 classification tool, Lough Bunny has been assigned an ecological status of High based on the fish populations present in 2012. The ecological status assigned to the lake based on the 2009 survey data was Good.

In the 2007 to 2009 surveillance monitoring reporting period, the EPA assigned Lough Bunny an overall ecological status of Moderate, based on all monitored physico-chemical and biological elements, including fish. This status classification will be revised at the end of 2012.

## 1.5 References

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