



# Sampling Fish for the Water Framework Directive

*Lakes 2011*

**Lough Allua**



Iascach Intíre Éireann  
Inland Fisheries Ireland

## Water Framework Directive Fish Stock Survey of Lough Allua, September 2011

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Cover photo: Lynda and Fiona gill netting © Inland Fisheries Ireland

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## 1.1 Introduction

Lough Allua is a ten kilometre chain of lakes situated near Ballingeary, Co. Cork in the Lee catchment (Plate 1.1, Fig. 1.1). The lake has a surface area of 138ha, a mean depth of 4m and a maximum depth of 28m. The lake falls into typology class 4 (as designated by the EPA for the Water Framework Directive), i.e. deep (mean depth >4m), larger than 50ha and low alkalinity (<20mg/l CaCO<sub>3</sub>).

Under the 2009 Cork Development plan, Lough Allua has been proposed as a Natural Heritage Area, indicating the presence of important semi-natural and natural habitats, landforms or geomorphological features, wild plant and animal species or a diversity of these natural attributes (Cork County Council, 2009). A local tour boat has recently commenced trips on the lake.

Historically Lough Allua was known for producing good trout, salmon and Arctic char. In the 1830s there was an accidental release of pike from a local privately owned pond and this event and human predation were attributed to the destruction of the char population in the lake (Went, 1945). The lake is now well known for its pike angling, with pike of between 10kg and 14kg regularly being caught.

Water quality monitoring is carried out on the lake on a monthly basis by the Southwestern Regional Fisheries Board.

Lough Allua was previously surveyed in 2008 as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al.*, 2009). During this survey, perch were found to be the dominant species present in the lake. Roach, rudd, bream, pike, gudgeon, roach x bream hybrids, rudd x bream hybrids and eels were also captured during the survey.



Plate 1.1. Lough Allua

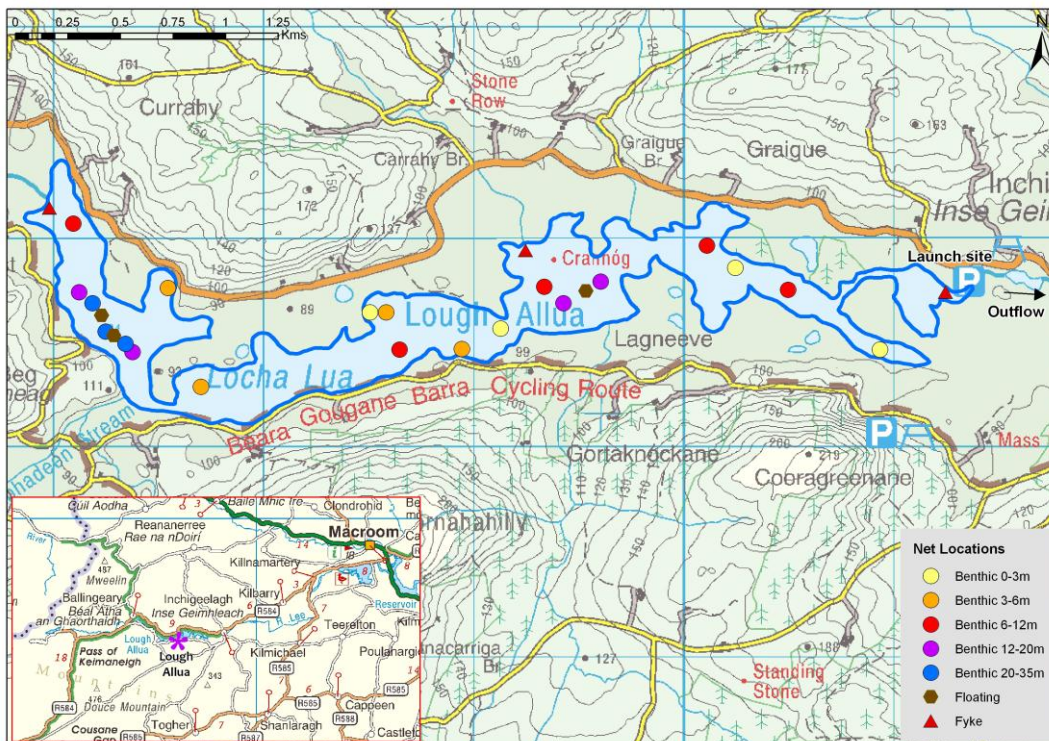


Fig. 1.1. Location map of Lough Allua showing locations and depths of each net (outflow is indicated on map)

## **1.2 Methods**

Lough Allua was surveyed over two nights between the 20<sup>th</sup> and the 22<sup>nd</sup> of September 2011. A total of three sets of Dutch fyke nets, 20 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (4 @ 0-2.9m, 4 @ 3-5.9m, 5 @ 6-11.9m, 4 @ 12-19.9m and 3 @ 20-34.9m) and three floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake (26 sites). Nets were deployed in the same locations as were randomly selected in the previous survey in 2008. 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 brown trout, rudd, roach, hybrids, bream 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 retained for further analysis.

## **1.3 Results**

### ***1.3.1 Species Richness***

A total of eight fish species and one type of hybrid were recorded on Lough Allua in September 2011, with 449 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Roach was the most abundant fish species recorded, followed by roach x bream hybrids. During the previous survey in 2008 the same species composition was recorded with the exception of rudd x bream hybrids, which were present during the 2008 survey but were not captured in the current survey and brown trout which were present in the current survey but were not captured in the 2008 survey.

**Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Allua, September 2011**

| Scientific name                        | Common name          | Number of fish captured          |                                  |           | Total |
|--|----------------------|----------------------------------|----------------------------------|-----------|-------|
|  |                      | Benthic mono multimesh gill nets | Surface mono multimesh gill nets | Fyke nets |       |
| <i>Rutilus rutilus</i>                 | Roach                | 203                              | 53                               | 2         | 258   |
| <i>Rutilus rutilus x Abramis brama</i> | Roach x Bream hybrid | 89                               | 3                                | 0         | 92    |
| <i>Perca fluviatilis</i>               | Perch                | 44                               | 0                                | 2         | 46    |
| <i>Abramis brama</i>                   | Bream                | 22                               | 0                                | 0         | 22    |
| <i>Gobio gobio</i>                     | Gudgeon              | 15                               | 0                                | 0         | 15    |
| <i>Salmo trutta</i>                    | Brown trout          | 6                                | 1                                | 0         | 7     |
| <i>Scardinius erythrophthalmus</i>     | Rudd                 | 4                                | 0                                | 0         | 4     |
| <i>Esox lucius</i>                     | Pike                 | 4                                | 0                                | 0         | 4     |
| <i>Anguilla anguilla</i>               | 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 2008 and 2011 are summarised in Table 1.2. Mean CPUE and BPUE for all fish species is illustrated in Figures 1.2 and 1.3.

The mean roach CPUE was significantly higher in 2011 than in 2008 ( $z = -3.637$ ,  $P < 0.00$ ). The differences in the mean roach CPUE between Lough Allua and three other similar lakes were also assessed and found to be statistically significant (Kruskal-Wallis,  $P < 0.05$ ) (Fig. 1.4). Independent-Samples Mann-Whitney U tests between each lake showed that Lough Allua had a significantly higher mean roach CPUE than Lough Gill and Lough Owel ( $z = -2.626$   $P < 0.05$  and  $z = -4.034$   $P < 0.05$ ).

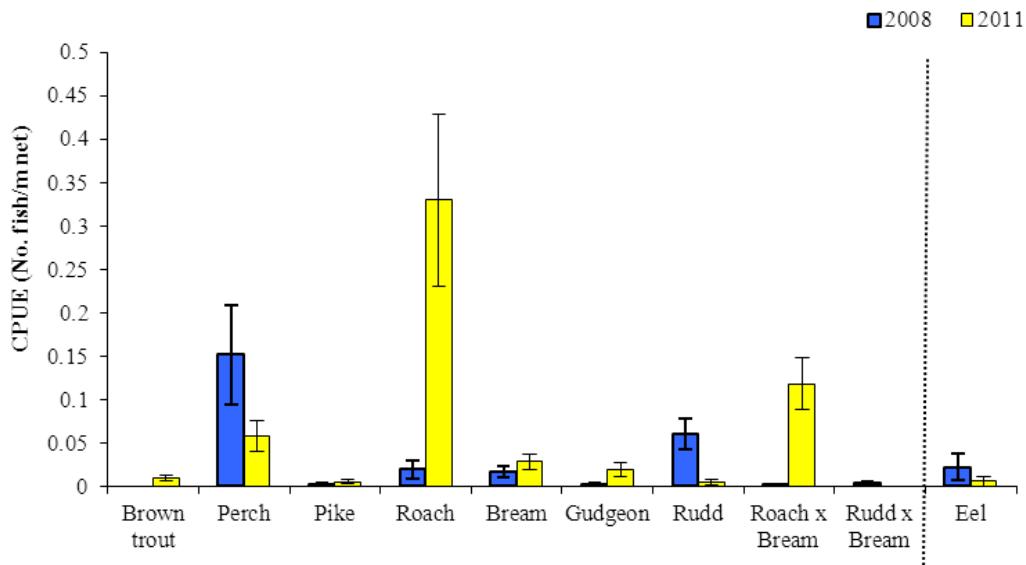
The mean roach BPUE was also significantly higher in 2011 than in 2008 ( $z = -3.657$ ,  $P < 0.00$ ). The differences in the mean roach BPUE between Lough Allua and three other similar lakes were assessed and found to be statistically significant (Kruskal-Wallis,  $P < 0.05$ ) (Fig. 1.5). Independent-Samples Mann-Whitney U tests between each lake showed that Lough Allua had a significantly lower mean roach BPUE than Lough Meelagh ( $z = -5.001$ ,  $P < 0.05$ ) and Lough Allua had a significantly higher mean roach BPUE than Lough Gill and Lough Owel ( $z = -7.244$   $P < 0.05$  and  $z = -7.360$   $P < 0.05$ ).

**Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Allua, 2008 and 2011**

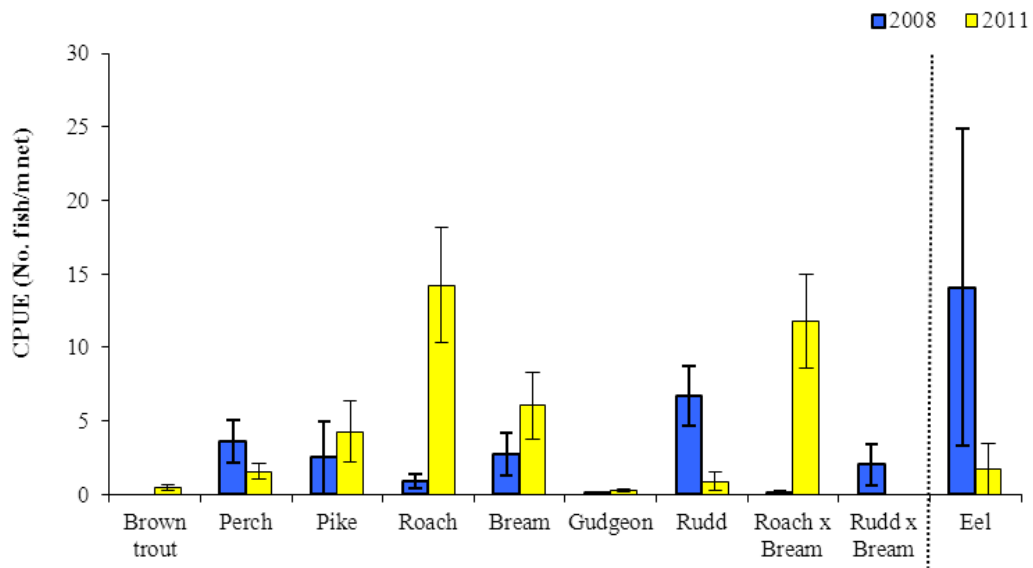
| Scientific name                                    | Common name          | 2008            | 2011           |
|--|----------------------|-----------------|----------------|
| <b>Mean CPUE</b>                                   |                      |                 |                |
| <i>Salmo trutta</i>                                | Brown trout          | -               | 0.008 (0.003)  |
| <i>Perca fluviatilis</i>                           | Perch                | 0.151 (0.057)   | 0.057 (0.017)  |
| <i>Esox lucius</i>                                 | Pike                 | 0.002 (0.001)   | 0.005 (0.002)  |
| <i>Rutilus rutilus</i>                             | Roach                | 0.019 (0.01)    | 0.329 (0.099)  |
| <i>Abramis brama</i>                               | Bream                | 0.016 (0.007)   | 0.028 (0.008)  |
| <i>Gobio gobio</i>                                 | Gudgeon              | 0.002 (0.001)   | 0.019 (0.007)  |
| <i>Scardinius erythrophthalmus</i>                 | Rudd                 | 0.060 (0.018)   | 0.005 (0.003)  |
| <i>Rutilus rutilus x Abramis brama</i>             | Roach x Bream hybrid | 0.001 (0.001)   | 0.117 (0.029)  |
| <i>Scardinius erythrophthalmus x Abramis brama</i> | Rudd x Bream hybrid  | 0.003 (0.002)   | -              |
| <i>Anguilla anguilla</i>                           | European eel         | 0.022 (0.014)   | 0.005 (0.005)  |
| <b>Mean BPUE</b>                                   |                      |                 |                |
| <i>Salmo trutta</i>                                | Brown trout          | -               | 0.438 (0.191)  |
| <i>Perca fluviatilis</i>                           | Perch                | 3.612 (1.471)   | 1.572 (0.516)  |
| <i>Esox lucius</i>                                 | Pike                 | 2.5 (2.447)     | 4.248 (2.081)  |
| <i>Rutilus rutilus</i>                             | Roach                | 0.861 (0.487)   | 14.243 (3.906) |
| <i>Abramis brama</i>                               | Bream                | 2.761 (1.429)   | 6.033 (2.294)  |
| <i>Gobio gobio</i>                                 | Gudgeon              | 0.018 (0.012)   | 0.242 (0.093)  |
| <i>Scardinius erythrophthalmus</i>                 | Rudd                 | 6.698 (1.997)   | 0.903 (0.582)  |
| <i>Rutilus rutilus x Abramis brama</i>             | Roach x Bream hybrid | 0.098 (0.098)   | 11.781 (3.226) |
| <i>Scardinius erythrophthalmus x Abramis brama</i> | Rudd x Bream hybrid  | 2.042 (1.379)   | -              |
| <i>Anguilla anguilla</i>                           | European eel         | 14.061 (10.781) | 1.744 (1.744)  |

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

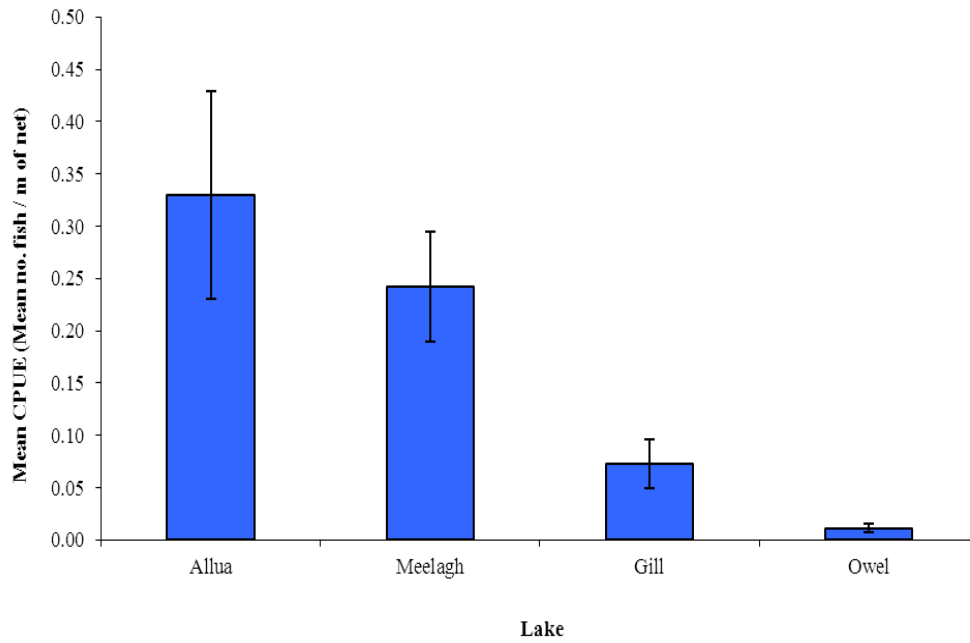




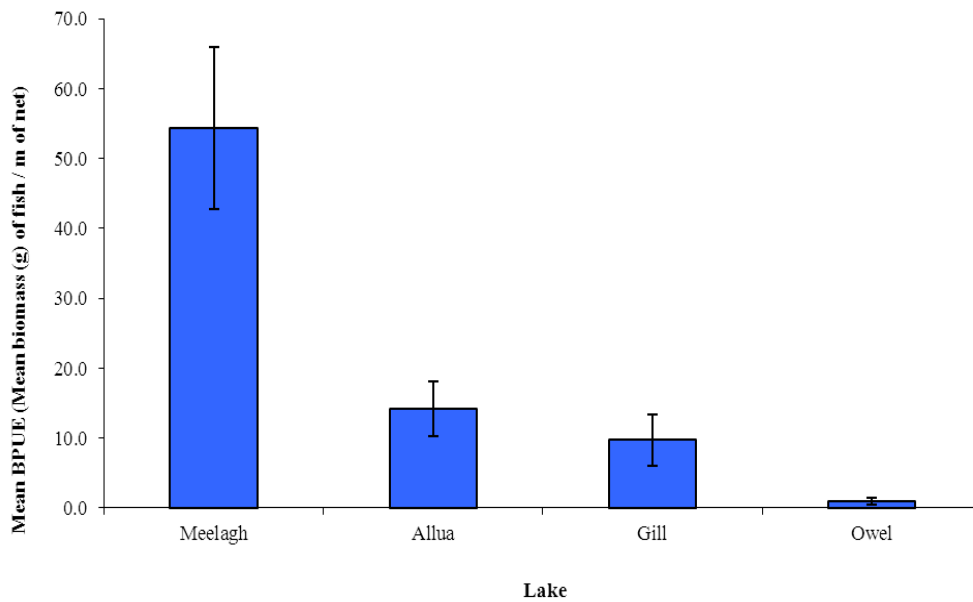
**Fig. 1.2. Mean ( $\pm$ S.E.) CPUE for all fish species captured in Lough Allua (Eel CPUE based on fyke nets only), 2008 and 2011**



**Fig. 1.3. Mean ( $\pm$ S.E.) BPUE for all fish species captured in Lough Allua (Eel CPUE based on fyke nets only), 2008 and 2011**



**Fig. 1.4. Mean ( $\pm$ S.E.) roach CPUE in four lakes surveyed during 2011**



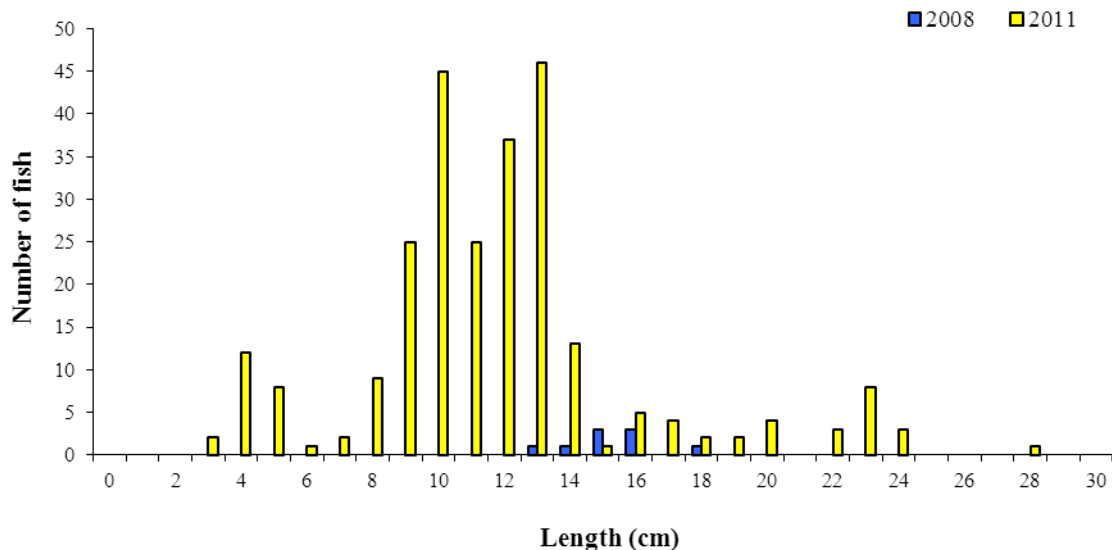
**Fig. 1.5. Mean ( $\pm$ S.E.) roach BPUE in four lakes surveyed during 2011**

### 1.3.3 Length frequency distributions

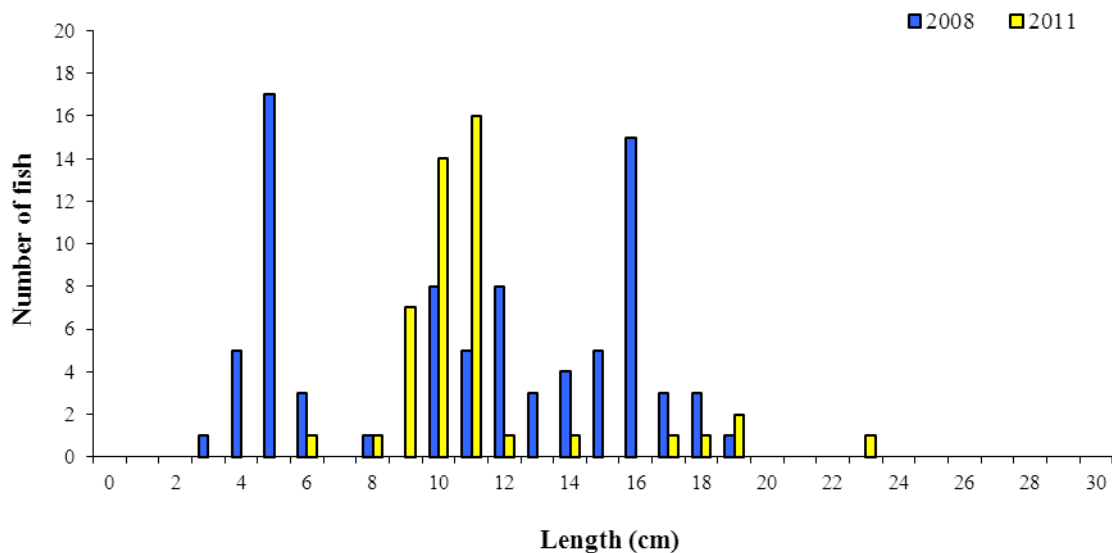
Roach captured during the 2011 survey ranged in length from 3.1cm to 28.8cm (mean = 12.1cm) (Fig.1.6). Roach captured during the 2008 survey had lengths ranging from 13.0cm to 18.1cm (Fig.1.6).

Perch captured during the 2011 survey ranged in length from 6.9cm to 23.0cm (mean = 11.5cm) (Fig. 1.7). Perch captured during the 2008 survey ranged in length from 3.8cm to 19.4cm (Fig. 1.7).

Brown trout captured during the 2011 survey ranged in length from 12.8cm to 17.7cm, bream ranged in length from 8.0cm to 28.1cm, pike ranged in length from 43.2cm to 53.3cm and gudgeon ranged from 7.2cm to 10.7cm. Rudd ranged in length from 18.0cm to 22.0cm and roach x bream hybrids ranged in length from 8.0cm to 31.9cm.



**Fig. 1.6. Length frequency of roach captured on Lough Allua, 2008 and 2011**



**Fig. 1.7. Length frequency of perch captured on Lough Allua, 2008 and 2011**

### 1.3.4 Fish age and growth

Nine age classes of roach were present, ranging from 0+ to 8+, with a mean L1 of 2.7cm (Table 1.3). In the 2008 survey, all roach recorded were aged 3+ with a mean L1 of 3.5cm.

Three age classes of perch were present, ranging from 1+ to 3+, with a mean L1 of 5.5cm (Table 1.4). In the 2008 survey, perch ranged from 0+ to 3+ with a mean L1 of 5.9cm.

Two age classes of brown trout were present, ranging from 1+ to 2+, seven age classes of bream were present ranging from 1+ to 9+, pike ranged in age from 2+ to 3+, roach x bream hybrids ranged in age from 2+ to 7+ and rudd ranged in age from 4+ to 6+.

**Table 1.3. Mean ( $\pm$ SE) roach length (cm) at age for Lough Allua, September 2011**

|       | <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> | <b>L<sub>7</sub></b> | <b>L<sub>8</sub></b> |
|-------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Mean  | 2.7<br>(0.1)         | 7.1<br>(0.2)         | 12.9<br>(0.5)        | 17.1<br>(0.4)        | 20.4<br>(0.4)        | 21.9<br>(0.4)        | 24.3<br>(1.6)        | 27.9                 |
| N     | 51                   | 43                   | 22                   | 14                   | 12                   | 5                    | 2                    | 1                    |
| Range | 1.5-5.3              | 3.7-<br>12.6         | 8.6-<br>17.1         | 12.8-<br>19.0        | 16.6-<br>21.8        | 20.3-<br>22.8        | 22.6-<br>25.9        | 27.9-<br>27.9        |

**Table 1.4. Mean ( $\pm$ SE) perch length (cm) at age for Lough Allua, September 2011**

|       | L <sub>1</sub> | L <sub>2</sub> | L <sub>3</sub> |
|-------|----------------|----------------|----------------|
| Mean  | 5.5 (0.1)      | 10.4 (1.0)     | 13.7 (0.4)     |
| N     | 30             | 7              | 2              |
| Range | 3.4-6.8        | 7.9-15.5       | 13.3-14.2      |

#### 1.4 Summary

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

The mean roach CPUE was significantly higher in 2011 than in 2008. The mean roach CPUE in Lough Allua was significantly higher than Lough Gill, Co. Sligo and Lough Owel, Co. Westmeath.

The mean roach BPUE was also significantly higher in 2011 than in 2008. The mean roach BPUE in Lough Allua was significantly higher than Lough Gill and Lough Owel and significantly lower than Lough Meelagh.

Roach ranged in age from 0+ to 8+, indicating reproductive success in recent years. The dominant age class of roach was 2+. Perch ranged in age from 1+ to 3+, with 1+ fish being dominant, indicating reproductive success in recent years. Brown trout ranged in age from 1+ to 2+, indicating reproductive success in the previous two 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 Allua has been assigned an ecological status of Moderate based on the fish populations present in 2011. The ecological status assigned to the lake based on the 2008 survey data was Poor/Bad.

In the 2007 to 2009 surveillance monitoring reporting period, the EPA assigned Lough Allua 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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