



# Sampling Fish for the Water Framework Directive

Lakes 2010

**Ardderry Lough**



Iascach Intíre Éireann  
Inland Fisheries Ireland

## **ACKNOWLEDGEMENTS**

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## 1.1 Introduction

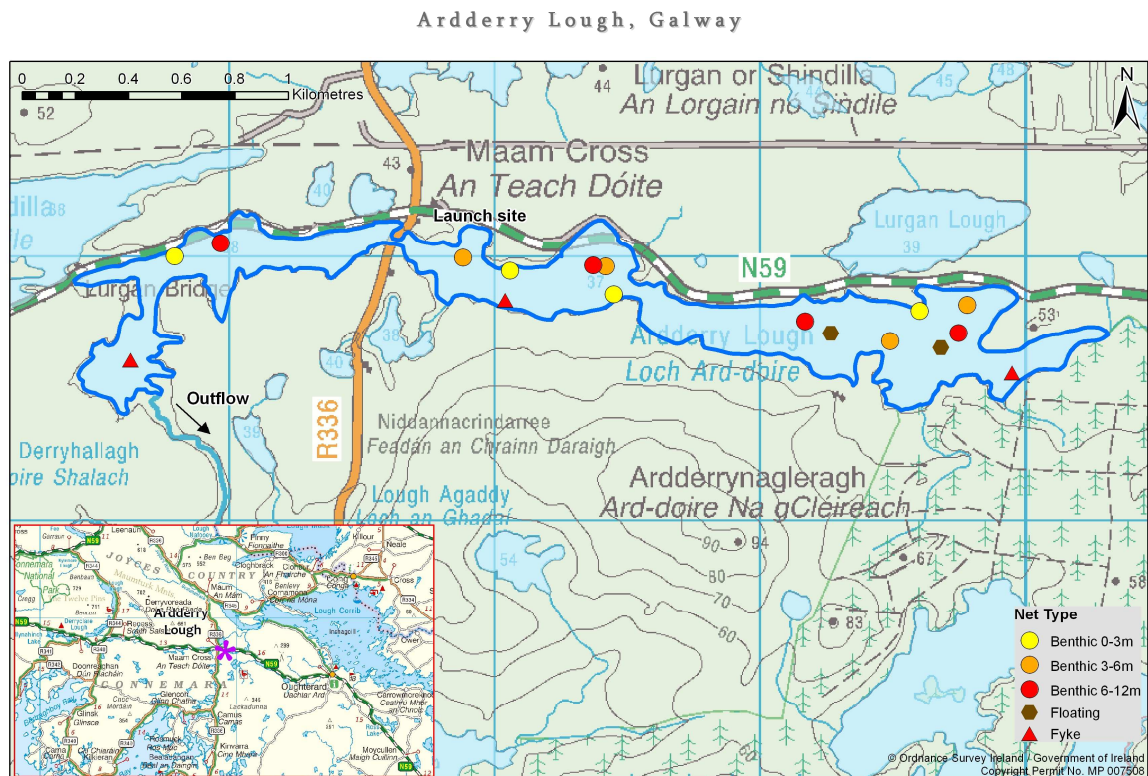
Ardderry Lough (Plate 1.1, Fig 1.1) is the second lake on the Screebe system in Co. Galway. The lake is located adjacent to Maam Cross and to the south of the N59 Galway to Clifden road at an altitude of 37m a.s.l. The underlying geology is categorised as siliceous. The lake has a surface area of 81.1ha, a mean depth of >4m and a maximum depth of 12m. The lake falls into typology class 4 (as designated by the EPA for the Water Framework Directive), i.e. deep (>4m), greater than 50ha and low alkalinity (<20mg/l CaCO<sub>3</sub>).

The lake holds a large stock of brown trout, the average size of which is 0.3kg (O' Reilly, 2007). Ardderry Lough was previously surveyed in 2007 as part of the WFD surveillance monitoring programme (Kelly and Connor, 2007). During this survey, perch and brown trout were found to be the dominant species present in the lake. Arctic char (previously not known to exist in this lake), adult salmon and eels were also captured during the survey.



**Plate 1.1. Ardderry Lough**





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

## 1.2 Methods

Ardderry Lough was surveyed over two nights from the 8<sup>th</sup> to the 10<sup>th</sup> of September 2010. A total of three sets of Dutch fyke nets, 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) and two floating benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake (17 sites). Nets were deployed in the same locations as were randomly selected in the previous survey. 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 were measured and weighed on site and scales were removed from all roach, sea trout and brown trout. 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 four fish species (sea trout are included as a separate ‘variety’ of trout) were recorded on Ardderry Lough in September 2010, with 131 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 eels and brown trout. During the previous survey in 2007 the same species composition was recorded, with the exception of salmon which were present during the 2007 survey but were not captured in the current survey, and sea trout which were present in the current survey but were not captured during the 2007 survey.

**Table 1.1. Number of each fish species captured by each gear type during the survey on Ardderry Lough, September 2010**

| Scientific name           | Common name  | Number of fish captured             |                                     |           |       |
|---------------------------|--------------|-------------------------------------|-------------------------------------|-----------|-------|
|                           |              | Benthic mono<br>multimesh gill nets | Surface mono<br>multimesh gill nets | Fyke nets | Total |
| <i>Perca fluviatilis</i>  | Perch        | 93                                  | 2                                   | 1         | 96    |
| <i>Anguilla anguilla</i>  | European eel | 0                                   | 0                                   | 24        | 24    |
| <i>Salmo trutta</i>       | Brown trout  | 9                                   | 0                                   | 0         | 9     |
| <i>Salmo trutta</i>       | Sea trout    | 1                                   | 0                                   | 0         | 1     |
| <i>Salvelinus alpinus</i> | Arctic char  | 1                                   | 0                                   | 0         | 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 from 2007 and 2010 are summarised in Table 1.2. Mean CPUE for all fish species from 2007 and 2010 is illustrated in Figure 1.2. Although both the mean brown trout CPUE and mean char CPUE were lower in 2010 than in 2007, these differences were not statistically significant. Similarly, the increase in mean perch CPUE between 2007 and 2010 was not statistically significant. In contrast, the mean eel CPUE was significantly higher in 2010 than in 2007 (t-test,  $t_{4}=-3.479$ ,  $P<0.05$ ).

The differences in the mean brown trout CPUE between Ardderry Lough and three other similar lakes were assessed and were found to be statistically significant (Kruskal-Wallis,  $P<0.001$ ) (Fig. 1.3). Independent-Samples Mann-Whitney U tests between each lake showed that Ardderry Lough had a significantly lower mean brown trout CPUE than Maumwee Lough ( $z = -4.196$ ,  $P<0.001$ ).

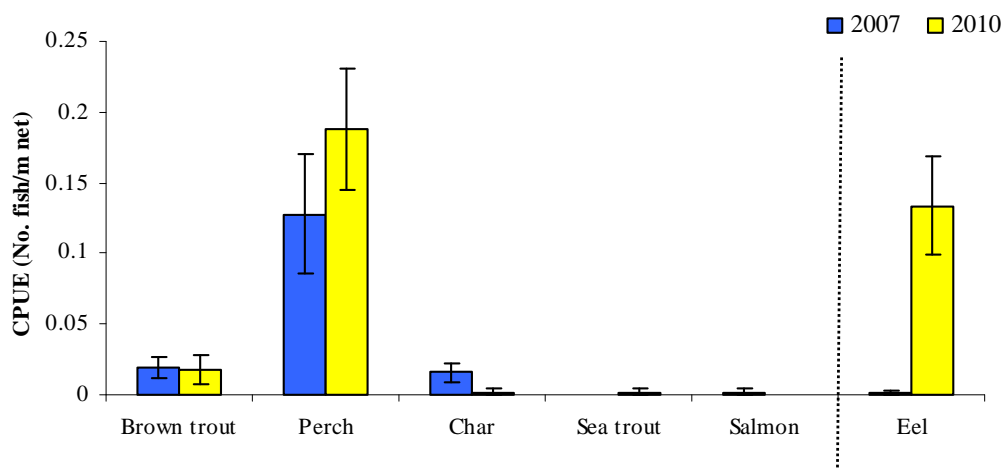
The difference in the mean perch CPUE between Ardderry Lough and Lough Shindilla (a similar lake type) was assessed and found to be statistically significant. An Independent-Samples Mann-Whitney

U test between each lake showed that Ardderry Lough had a significantly higher mean perch CPUE than Lough Shindilla ( $z = -3.551$ ,  $P < 0.001$ ).

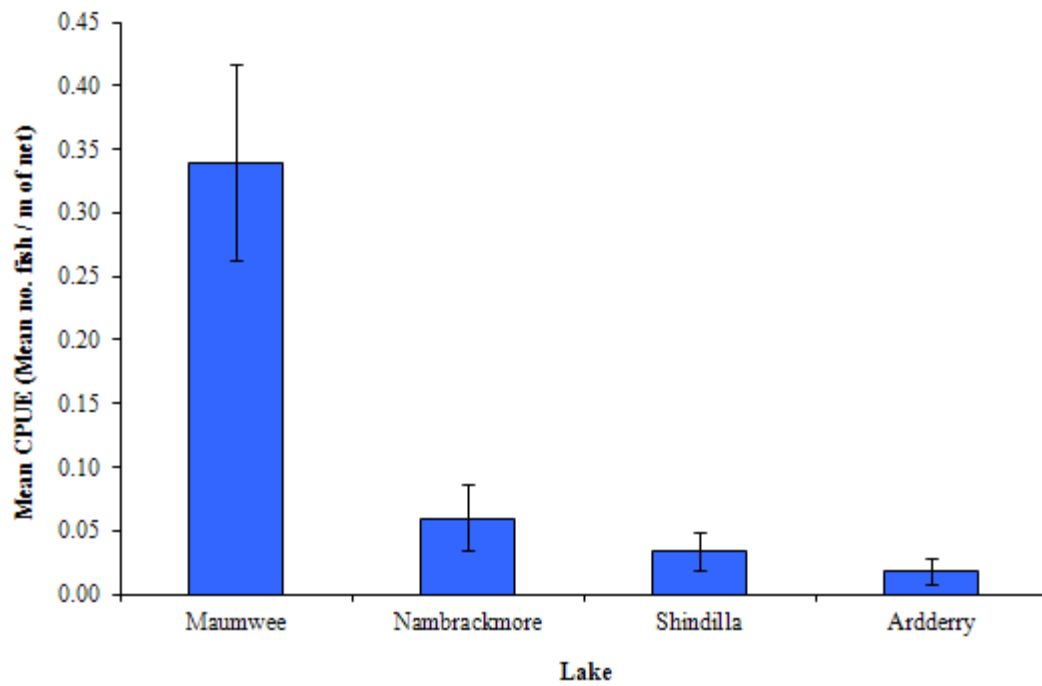
**Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Ardderry Lough, 2007 and 2010**

| Scientific name           | Common name  | 2007           | 2010           |
|---------------------------|--------------|----------------|----------------|
| <b>Mean CPUE</b>          |              |                |                |
| <i>Salmo trutta</i>       | Brown trout  | 0.019 (0.007)  | 0.017(0.009)   |
| <i>Perca fluviatilis</i>  | Perch        | 0.127 (0.042)  | 0.187 (0.042)  |
| <i>Salvelinus alpinus</i> | Arctic char  | 0.015 (0.007)  | 0.002 (0.002)  |
| <i>Salmo trutta</i>       | Sea trout    | -              | 0.002 (0.002)  |
| <i>Salmo salar</i>        | Salmon       | 0.002 (0.002)  | -              |
| <i>Anguilla anguilla</i>  | European eel | 0.002 (0.001)  | 0.133 (0.034)  |
| <b>Mean BPUE</b>          |              |                |                |
| <i>Salmo trutta</i>       | Brown trout  | 3.347 (1.340)  | 2.400 (1.526)  |
| <i>Perca fluviatilis</i>  | Perch        | 18.200 (5.641) | 19.339 (4.534) |
| <i>Salvelinus alpinus</i> | Arctic char  | 1.950 (0.901)  | 0.378 (0.378)  |
| <i>Salmo trutta</i>       | Sea trout    | -              | 0.458 (0.458)  |
| <i>Salmo salar</i>        | Salmon       | 4.901 (4.901)  | -              |
| <i>Anguilla anguilla</i>  | European eel | 3.616 (1.838)  | 18.088 (6.748) |

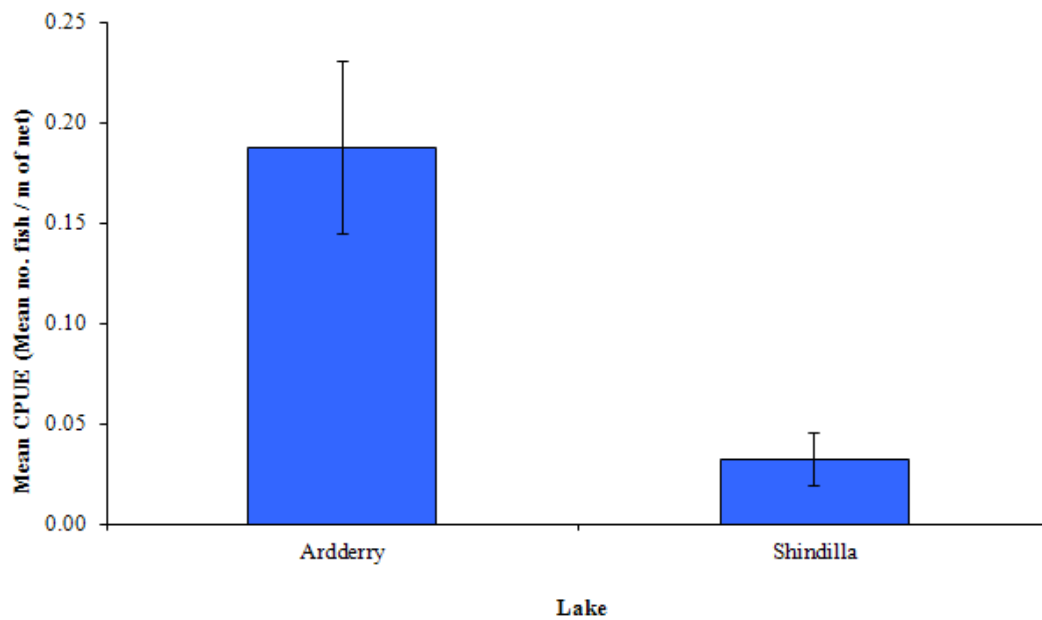
\* On the rare occasion where biomass data was unavailable for an individual fish, this was determined from a length/weight regression for that species.



**Fig. 1.2. Mean (±S.E.) CPUE on Ardderry Lough (Eel CPUE based on fyke nets only), 2007 and 2010**



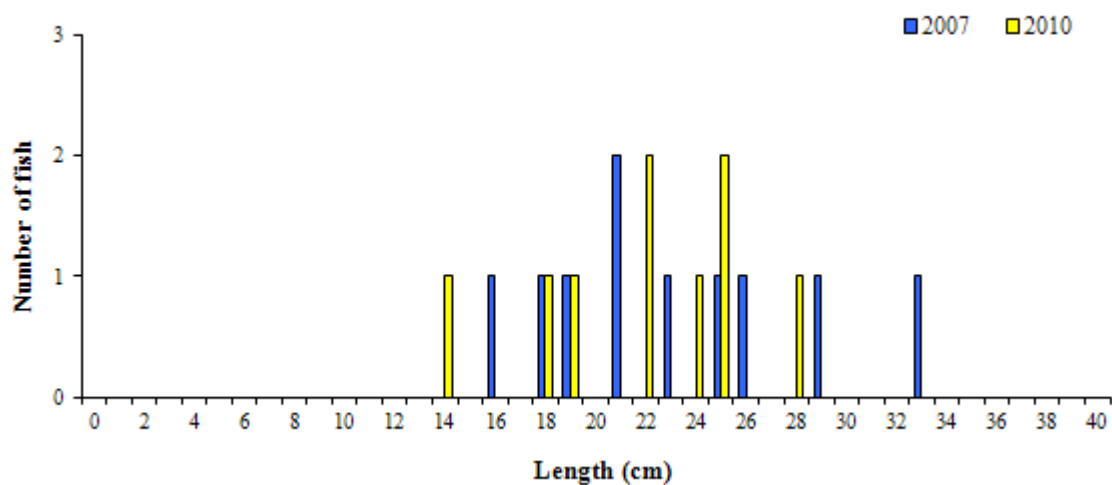
**Fig. 1.3. Mean ( $\pm$ S.E.) brown trout CPUE in four lakes surveyed during 2010**



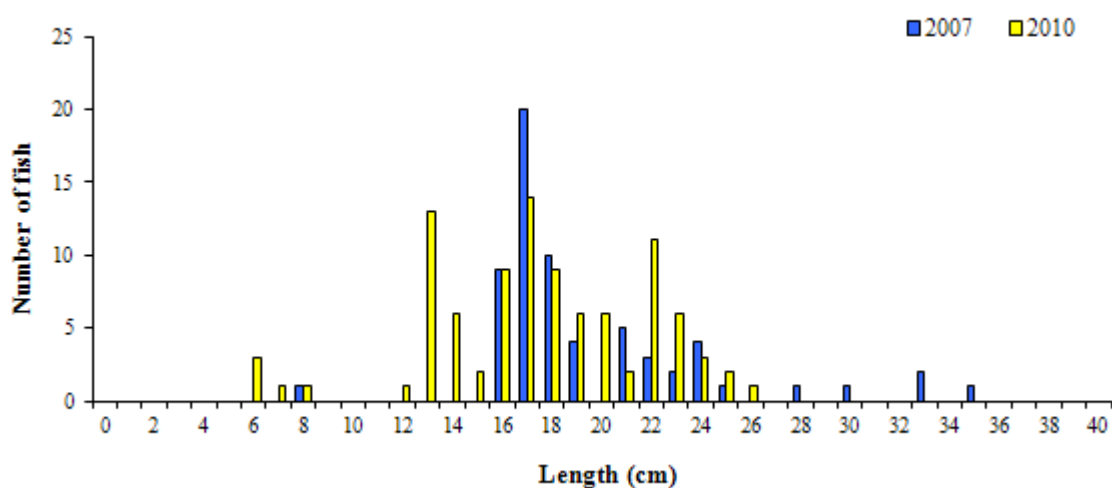
**Fig. 1.4. Mean ( $\pm$ S.E.) perch CPUE in two lakes surveyed during 2010**

### 1.3.3 Length frequency distributions

Brown trout captured during the 2010 survey ranged in length from 14.2cm to 28.0cm (mean = 22.1cm) (Fig. 1.5). Brown trout captured during the 2007 survey ranged in length from 16.0cm to 33.0cm (Fig. 1.5). Perch captured during the 2010 survey ranged in length from 6.8cm to 26.8cm (mean = 17.9cm) (Fig.1.6). Perch captured during the 2007 survey ranged in length from 8.8cm to 35.5cm (Fig.1.6). Eels captured during the 2010 survey ranged in length from 31.4cm to 61.4cm. One sea trout and one Arctic char were recorded measuring 28.2cm and 27.9cm respectively.



**Fig. 1.5. Length frequency of brown trout captured on Ardderry Lough**



**Fig. 1.6. Length frequency of perch captured on Ardderry Lough**



### 1.3.4 Fish age and growth

Six age classes of perch were present, ranging from 0+ to 5+, with a mean L1 of 7.8cm (Table 1.3). In the 2007 survey, perch ranged from 2+ to 8+ with a mean L1 of 10.0cm.

Three age classes of brown trout were present, ranging from 2+ to 4+, with a mean L1 of 6.9cm (Table 1.4). Similar growth patterns were observed during the 2007 survey with brown trout ranging from 2+ to 4+ with a mean L1 of 6.4cm. Brown trout L4 was 22.3cm indicating a very slow rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971).

The single Arctic char captured was aged 4+ and the single sea trout captured was aged at 2.0+1SM.

**Table 1.3. Mean ( $\pm$ SE) perch length (cm) at age for Ardderry Lough, September 2010**

|       | L <sub>1</sub> | L <sub>2</sub> | L <sub>3</sub> | L <sub>4</sub> | L <sub>5</sub> |
|-------|----------------|----------------|----------------|----------------|----------------|
| Mean  | 7.8 (0.2)      | 16.3 (0.3)     | 20.5 (0.3)     | 22.6 (0.4)     | 26.0           |
| N     | 67             | 52             | 29             | 13             | 1              |
| Range | 5.5-11.2       | 13-20.6        | 18.3-23.7      | 19.8-25.3      | 26.0-26.0      |

**Table 1.4. Mean ( $\pm$ SE) brown trout length (cm) at age for Ardderry Lough, September 2010**

|       | L <sub>1</sub> | L <sub>2</sub> | L <sub>3</sub> | L <sub>4</sub> |
|-------|----------------|----------------|----------------|----------------|
| Mean  | 6.9 (0.5)      | 15.0 (1.1)     | 21.3 (1.0)     | 22.3           |
| N     | 8              | 8              | 6              | 1              |
| Range | 4.8-8.6        | 11.1-19.8      | 18.5-25.0      | 22.3-22.3      |

## 1.4 Summary

Perch was the dominant species in terms of both abundance (CPUE) and biomass (BPUE). The mean perch CPUE in Ardderry Lough was significantly higher than Lough Shindilla, another similar type lake. Perch ranged in age from 0+ to 5+, indicating reproductive success in each of the previous five years. Although the mean perch CPUE was higher in 2010 than in 2007, this was not statistically significant.

The mean brown trout CPUE in Ardderry Lough was significantly lower than Maumwee Lough, but not significantly different from the other two lakes assessed. Brown trout ranged in age from 2+ to 4+, with no younger age classes being recorded. This is likely due to the low sample size of brown trout captured rather than a recruitment failure in the previous two years. It could also be the case that younger brown trout remain in the nursery streams during their first two years. Length at age

analyses revealed that brown trout in the lake exhibit a very slow rate of growth according to the classification scheme of Kennedy and Fitzmaurice (1971).

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 (AFBNI) 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. Using the FIL2 classification tool, Ardderry Lough has been assigned an ecological status of Good based on the fish populations present in the 2010 survey.

In the 2007 to 2009 surveillance monitoring reporting period, the EPA assigned Ardderry Lough an overall ecological status of Good, 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

- Kennedy, M. and Fitzmaurice, P. (1971) Growth and Food of Brown Trout *Salmo Trutta* (L.) in Irish Waters. *Proceedings of the Royal Irish Academy*, **71 (B) (18)**, 269-352.
- Kelly, F. and Connor, L. (2007) *WFD Surveillance Monitoring - Fish in Lakes 2007*. Central Fisheries Board report.
- Kelly, F.L., Harrison, A., Connor, L., Allen, M., Rosell, R. and Champ, T. (2008) *FISH IN LAKES Task 6.9: Classification tool for Fish in Lakes. FINAL REPORT*. Central Fisheries Board, NSSHARE project.
- O’ Reilly, P. (2007) *Loughs of Ireland. A Flyfisher’s Guide*. 4<sup>th</sup> Edition. Merlin Unwin Books.

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