Lough Anure

Sampling Fish for the
Water Framework Directive -
Lakes 2009

The Central and Regional
Fisheries Boards

ACKNOWLEDGEMENTS

1.1 Introduction

Lough Anure (Plate 1.1, Fig. 1.1) is situated adjacent to the village of Loch Anure, approximately 8km north-east of Dungloe, Co. Donegal. The lake is the largest in the Rosses system and drains into the sea through the River Crolly (Gweedore River). Lough Anure is very rocky, with a surface area of 156ha, a mean depth of only 2m and maximum depth of 12m. The lake is categorised as typology class 2 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. shallow (<4m), greater than 50ha and low alkalinity (<20mg/l CaCO3). The lake has been classed as 1a (i.e. at risk of failing to meet good status by 2015) in the WFD Characterization report (EPA, 2005). The geology of the area is predominantly granite, felsite and other intrusive rocks rich in silica.

The Rosses Anglers Association and the Electricity Supply Board both control the fishing rights to Lough Anure and it is considered to be one of the best trout fishing lakes in the area (O' Reilly, 2007) with brown trout averaging approximately 0.25kg and numerous fish weighing up to 0.5kg. The lake gets a good run of sea trout and occasional salmon from July (O' Reilly, 2007).

Lough Anure was surveyed previously during August 2006 as part of the NSSHARE Fish in Lakes Project (Kelly *et al*, 2007). Brown trout was found to be the dominant species, followed by eel and minnow. Growth and age analysis showed that the lake holds a population of slow growing brown trout, although growth was relatively fast in comparison to other low alkalinity lakes in the area.

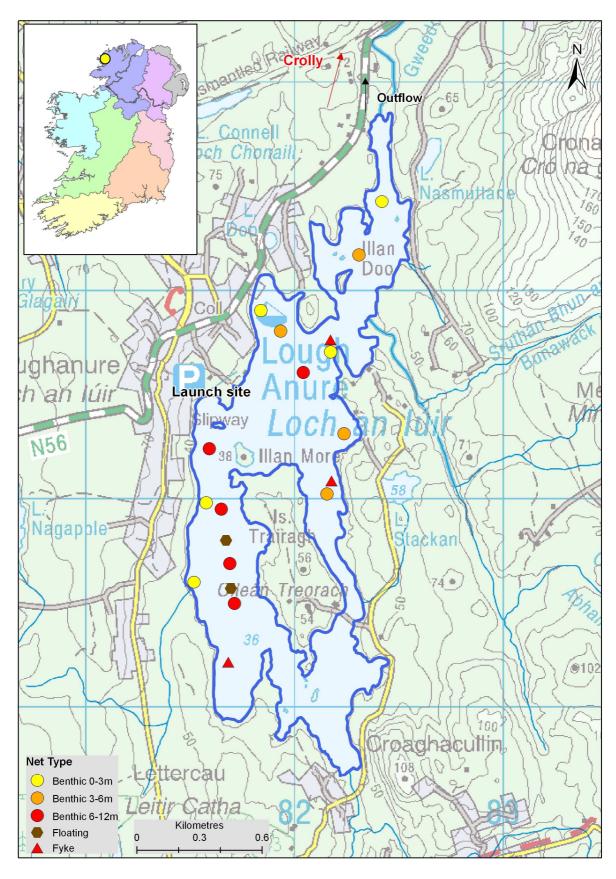**Plate 1.1. Lough Anure (A) looking south east and (B) looking west**

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

1.2 Methods

Lough Anure was surveyed over two nights from the 4th to the 5th of August 2009. A total of three sets of Dutch fyke nets, 14 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (5 @ 0-2.9m, 4 @ 3-5.9m and 5 @ 6-11.9m) and two surface floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake (19 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 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 returned to the laboratory for further analysis.

1.3 Results

1.3.1 Species Richness

A total of three fish species were recorded on Lough Anure in August 2009, with 155 fish being captured (Table 1.1). Brown trout (Plate 1.2) was the most abundant fish species recorded, followed by eels and minnow (Table 1.1). During the previous survey in 2006 a similar species composition was recorded with the exception of juvenile salmon, which were present during the 2006 survey but were not captured in the current survey.

Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Anure, August 2009

Scientific name	Common name	Number of fish captured			
		Benthic mono multimesh gill nets	Surface mono multimesh gill nets	Fyke nets	Total
Salmo trutta	Brown trout	72	12	8	92
Anguilla anguilla	European eel	1	0	37	38
Phoxinus phoxinus	Minnow	25	0	0	25

Plate 1.2. Brown trout from Lough Anure

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 the 2006 and 2009 surveys are summarised in Table 1.2. Mean CPUE is illustrated in Figure 1.2.

Although the mean brown trout CPUE was lower in 2009 than in 2006, this was not statistically significant. The differences in the mean brown trout CPUE between Lough Anure and three other similar lakes were assessed (Fig. 1.3). There was a significant difference in the mean brown trout CPUE among the four lakes assessed (Kruskal-Wallis, $P<0.05$). Independent-Samples Mann-Whitney U tests between each lake showed that Lough Anure had a significantly higher mean brown trout CPUE than Doo Lough ($z = -2.869$, $P<0.05$), however there was no significant difference between the brown trout CPUE from Lough Anure, Lough Tay and Lough Dan.

Table 1.2. Mean (S.E.) CPUE and BPUE of each fish species captured on Lough Anure

Scientific name	Common name	2006	2009
		Mean CPUE	
Salmo trutta	Brown trout	0.255 (0.0473)	0.154 (0.0318)
Phoxinus phoxinus	Minnow	0.024 (0.0124)	0.043 (0.0301)
Salmo salar	Salmon	0.003 (0.0024)	-
Anguilla anguilla	European eel	0.122 (0.0494)	0.205 (0.0588)
		Mean BPUE	
Salmo trutta	Brown trout	26.900 (6.671)	13.508 (3.619)
Phoxinus phoxinus	Minnow	0.147 (0.073)	0.226 (0.153)
Salmo salar	Salmon	0.087 (0.062)	-
Anguilla anguilla	European eel	24.028 (8.609)	28.916 (8.298)

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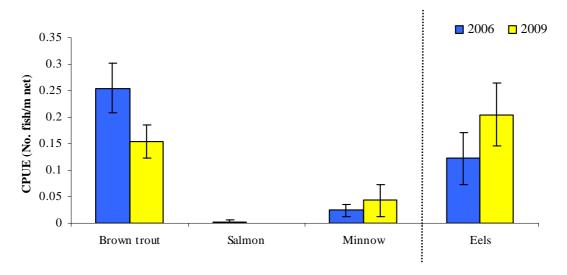

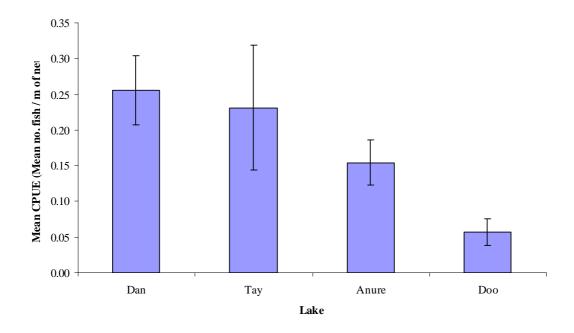**Fig. 1.2. Mean (±S.E.) CPUE of each fish species captured on Lough Anure (Eel CPUE based on fyke nets only)**

Fig. 1.3. Mean (±S.E.) brown trout CPUE in four lakes surveyed during 2009

1.3.3 Length frequency distributions

Brown trout captured during the 2009 survey ranged in length from 11.8cm to 30.6cm (mean = 19.3cm). Brown trout captured during the 2006 survey had similar lengths, ranging from 10.8cm to 30.6cm (Kelly *et al*, 2007) (Fig. 1.4). Eels captured during the 2009 survey ranged in length from 31.5cm to 62.5cm (mean = 42.7cm). Eels captured during the 2006 survey had similar lengths ranging from 36.0cm to 59.0cm (Kelly *et al*, 2007) (Fig.1.5). Minnow captured during the 2009 survey ranged in length from 4.8cm to 8.1cm.
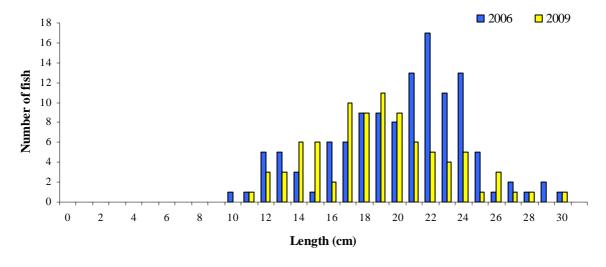

Fig. 1.4. Length frequency of brown trout captured on Lough Anure, August 2006 and 2009
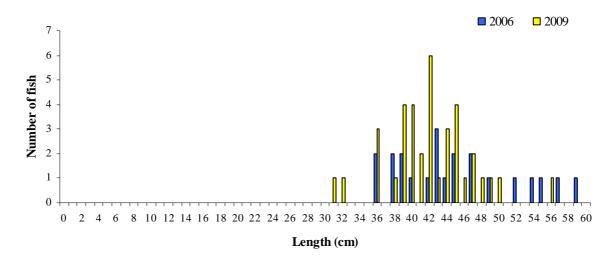
Fig. 1.5. Length frequency of eels captured on Lough Anure, August 2006 and 2009

1.3.4 Fish age and growth

Five age classes of brown trout were present, ranging from 1+ to 5+, with a mean L1 of 5.7cm (Table 1.3). Similar age and growth patterns were observed during the 2006 survey, with brown trout ages ranging from 1+ to 5+ and a mean L1 of 5.8 cm (Kelly *et al*, 2007). Mean brown trout L4 was 22.2cm indicating a very slow rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971).

Table 1.3. Mean (±SE) brown trout length (cm) at age for Lough Anure, August 2009

	L_1	L_2	L_3	L_4	L_5
Mean	5.7 (0.17)	12.6 (0.39)	18.3 (0.50)	22.2 (0.75)	25.9
N	56	43	27	8	1
Range	3.6-8.5	7.8-19.4	13.8-23.5	19.8-27.0	25.9-25.9

1.4 Summary

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

The mean brown trout CPUE in Lough Anure was significantly higher than Doo Lough. Although Lough Dan and Lough Tay exhibited a higher mean brown trout CPUE than Lough Anure, these differences were not statistically significant. Brown trout ages ranged from 1+ to 5+, indicating reproductive success in each of the previous five 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 WFD multimetric fish classification tool has been developed for the island of Ireland (Ecoregion 17) using CFB and Agri-Food and Biosciences Northern Ireland (AFBINI) data generated during the NSSHARE Fish in Lakes project (Kelly *et al.*, 2008). Using this tool, Lough Anure has been assigned an ecological status of High based on the fish populations present.

The EPA has assigned an overall status of Good to Lough Anure in an interim draft classification. This is based on physico-chemical parameters and biotic elements such as macroinvertebrates, macrophytes and fish.

1.5 References

EPA (2005) Submission in accordance with Article 5 of Directive 2000/60/EC of the European Parliament and of the Council of 23rd October 2000 establishing a framework for community action in the field of water policy, and in accordance with EC-DE Environment D.2 document "Reporting Sheets for 2005 Reporting" dated 19 November 2004. Version 2, May 2005. Prepared by the Office of Environmental Assessment EPA, Johnstown Castle, Wexford.

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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.

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