Lough Dan

Sampling Fish for the
Water Framework Directive -
Lakes 2009

The Central and Regional
Fisheries Boards

ACKNOWLEDGEMENTS

1.1 Introduction

Lough Dan is situated 5km west of Roundwood, Co.Wicklow (Plate 1.1, Fig. 1.1). It is a moraine-dammed lake situated in a steep sided valley in the Wicklow Mountains. Lough Dan is fed by Lough Tay via the Clohoge River from the north and is drained to the south by the Avonmore River (Fig. 1.1).

Lough Dan has a surface area of 106ha, a mean depth of 13.5m, a maximum depth of 40m and is located at an altitude of 203m a.s.l. The lake is categorised as typology class 4 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. deep (>4m), greater than 50ha and low alkalinity (<20mg/l CaCO3).

The surrounding geology of the lake is mostly granite. Most of the lake is surrounded by private lands, though the north-west corner is part of the Wicklow Mountains National Park. The lake forms part of the Wicklow Mountain Special Area of Conservation, is privately owned and fishing is not permitted (NPWS, 2001; O'Reilly, 2007). The Wicklow Mountain SAC has been designated as such for including 10 habitats which are listed on Annex I of the EU Habitats Directive. These include heath, blanket bog and upland grasslands. Due to the underlying rock strata in the SAC, the water of the rivers and streams tends to be acidic. The water is generally oligotrophic and free from nutrient enrichment. The deep lakes in the SAC, such as Lough Dan, are characteristically species poor (NPWS, 2001).

Plate 1.1. Lough Dan

Lough Dan holds a good stock of small, slow growing brown trout. A population of Arctic char was historically present in the lake (Went, 1945 and 1971; Tierney *et al*., 2000); however, the last authenticated record was validated in 1988 by the Natural History Museum of Ireland (Tierney *et al*., 2000). The lake was previously surveyed in 1985 and 1989 by the Central Fisheries Board (CFB,

unpublished data). The Eastern Regional Fisheries Board surveyed the lake in May and October 1994 and also resurveyed it in association with University College Dublin in 1996. No Arctic char were recorded during any of these surveys (Bowman, 1991; Igoe and Kelly-Quinn, 2002) and it was concluded that the population was extinct, probably as a result of acidification.
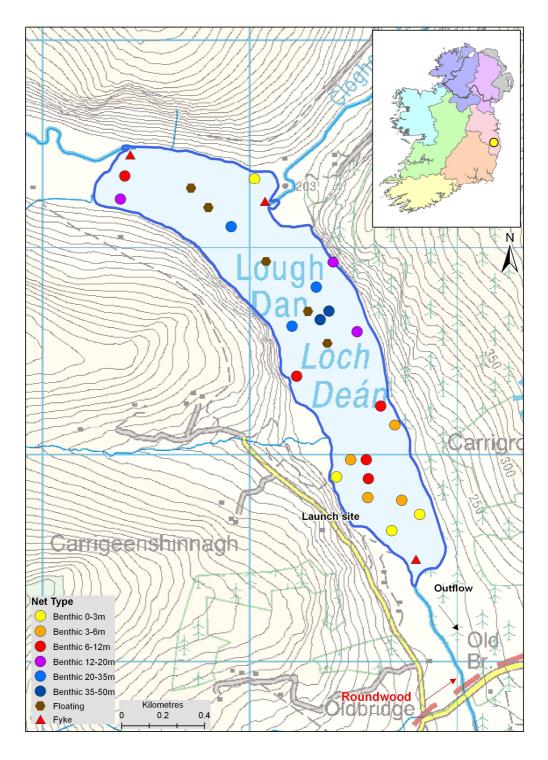

Fig. 1.1. Location map of Lough Dan showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lough Dan was surveyed over two nights from the 17th to the 19th of August 2009. 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, 4 @ 6-11.9m, 3 @ 12-19.9, 3 @ 20-34.9m and 2 @ 35-49.9m) and five surface monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed randomly in the lake (28 sites). Survey locations were randomly selected within each depth zone using a grid placed over a map of the lake. 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 two fish species were recorded in Lough Dan during the survey, with 229 fish being captured (Table 1.1). Brown trout was the most common fish species recorded, followed by European eel.

Table 1.1. List of fish species recorded (including numbers captured) during the survey on Lough Dan, 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	127	83	9	219
Anguilla anguilla	European eel	0	0	10	10

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 are summarised in Table 1.2.

The differences in the mean brown trout CPUE between Lough Dan and three other similar lakes were assessed and were found to be statistically significant (Kruskal-Wallis, $P<0.05$) (Fig. 1.2).

Independent-Samples Mann-Whitney U tests between each lake showed that Lough Dan had a significantly higher mean brown trout CPUE than Doo Lough, Co. Galway (z = -3.535, P<0.001).

Table 1.2. Mean (S.E.) CPUE and BPUE on Lough Dan, August 2009

Scientific name	Common name	
		Mean CPUE
Salmo trutta	Brown trout	0.255 (0.048)
Anguilla anguilla	European eel	0.056 (0.034)
		Mean BPUE
Salmo trutta	Brown trout	24.314 (4.696)
Anguilla anguilla	European eel	18.161 (11.717)

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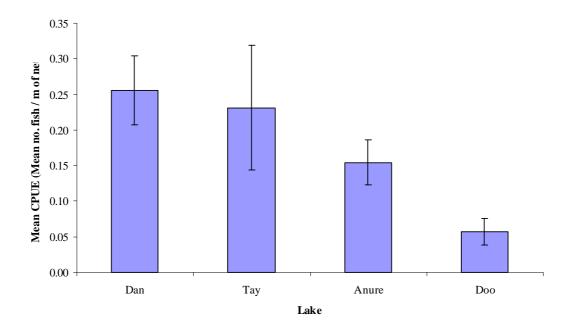

Fig. 1.2. Mean (±S.E.) brown trout CPUE in four lakes surveyed during 2009

1.3.3 Length frequency distributions

Brown trout ranged in length from 6.1cm to 40.0cm (mean = 19.3cm) (Fig. 1.3). Eels ranged in length from 38.0cm to 75.0cm (mean = 54.1cm) (Fig.1.4).
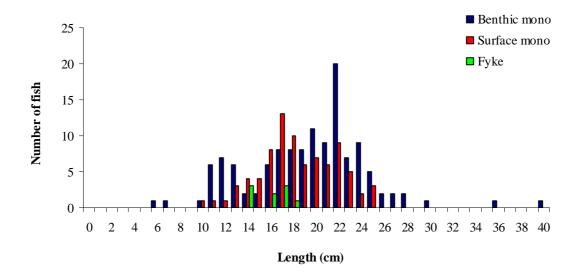
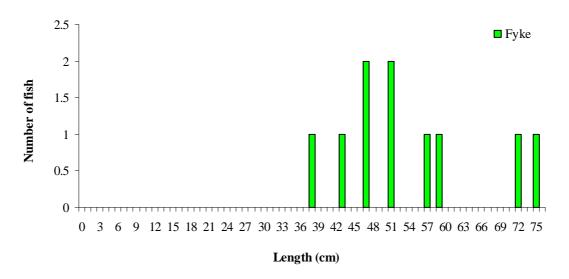**Fig. 1.3. Length frequency of brown trout (n=218) captured on Lough Dan, August 2009**

Fig. 1.4. Length frequency of eels (n=10) captured on Lough Dan, August 2009

1.3.4 Fish age and growth

Six age classes of brown trout were present, ranging from 0+ to 5+, with a mean L1 of 5.4cm (Table 1.3). Mean brown trout L4 was 21.8cm 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 Dan August, 2009

	L_1	L_2	L_3	L_4	L_5
Mean	5.4 (0.1)	13.0 (0.2)	18.7 (0.2)	21.8 (0.5)	25.6 (1.0)
N	198	169	92	23	2
Range	3.1-8.2	8.5-18.7	13.6-25.2	18.6-28.7	24.5-26.6

1.4 Summary

Brown trout was the dominant species in terms of both abundance (CPUE) and biomass (BPUE).

The mean brown trout CPUE in Lough Dan was significantly higher than Doo Lough. Although Lough Dan exhibited a higher mean brown trout CPUE than Lough Anure and Lough Tay, this was not statistically significant.

Brown trout ages ranged from 0+ 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 Dan has been assigned an ecological status classification of Good based on the fish populations present.

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

1.5 References

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