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National Research Survey Programme

Lakes 2015

Lough Dan

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National Research Survey Programme

Fish Stock Survey of Lough Dan, September 2015

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Cover photo: Netting survey on Lough Dan © Inland Fisheries Ireland

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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 Cloghoge 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).

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previously surveyed in 1985 and 1989 by Inland Fisheries Ireland (IFI) (previously the Central Fisheries Board) (IFI, unpublished data). IFI (previously the Eastern Regional Fisheries Board) also surveyed the lake in May and October 1994 and 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.

This lake was surveyed as part of the Water Framework Directive surveillance monitoring programme and was previously surveyed in 2009 and 2012 (Kelly *et al*., 2010 and 2013). During both of these surveys, brown trout were found to be the dominant species present in the lake. Minnow were captured in the 2012 survey but were not recorded in the 2009 survey. Eels were present in both survey years.

Plate 1.1. Lough Dan 2015

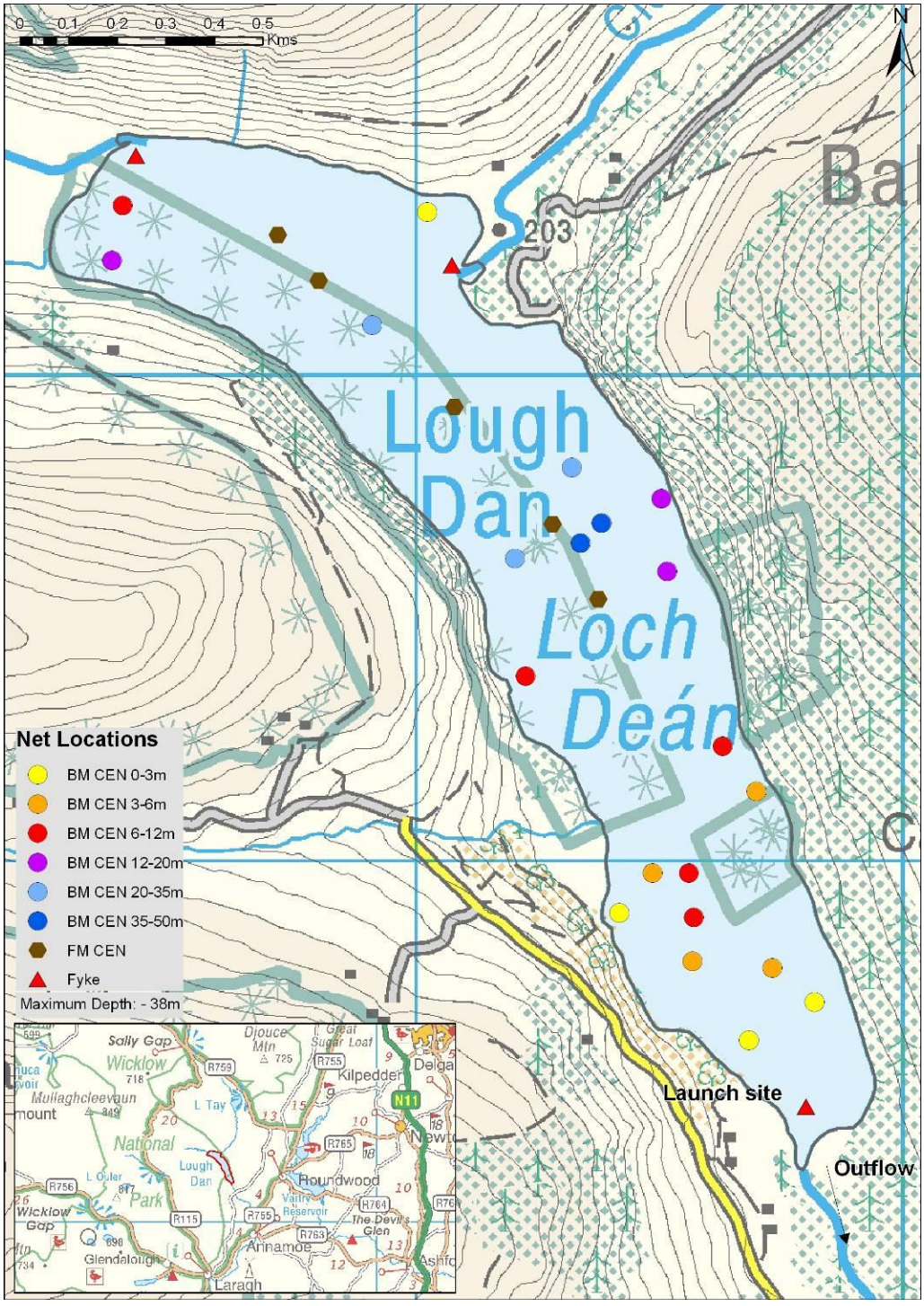

Fig. 1.1. Location map of Lough Dan showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

1.2.2 Netting methods

Lough Dan was surveyed over two nights from the 21st to the 23rd of September 2015. A total of three sets of Dutch fyke nets (fyke), 21 benthic monofilament multi-mesh (BM CEN) (12 panel, 5-55mm mesh knot to knot) CEN standard survey gill nets (4 @ 0-2.9m, 4 @ 3-5.9m, 5 @ 6-11.9m, 3 @ 12-19.9m, 3 @ 20-34.9m and 2 @ 35-49.9m) and five surface monofilament multi-mesh (FM CEN) (12 panel, 5-55mm mesh knot to knot) CEN standard survey gill nets were deployed randomly in the lake (29 sites). Nets were deployed in the same locations as were randomly selected in the previous surveys in 2009 and 2012. 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.

1.2.2 Biosecurity - disinfection and decontamination procedures

Procedures are required for disinfection of equipment in order to prevent dispersal of alien species and other organisms to uninfected waters. A standard operating procedure was compiled by Inland Fisheries Ireland for this purpose (Caffrey, 2010) and is followed by staff on the IFI NRSP team when moving between water bodies.

1.3 Results

1.3.1 Species Richness

Two fish species were recorded on Lough Dan in September 2015, with 238 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Brown trout was the most abundant fish species recorded, followed by minnow. During the previous surveys in 2009 and 2012 the same species composition was recorded with the exception of minnow, which were only recorded during the 2012 and 2015 surveys and eels were not recorded during the 2015 survey (Kelly *et al.*, 2010 and 2013).

Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Dan, August 2015

Scientific name	Common name	Number of fish captured			
		BM CEN	FM CEN	Fyke	Total
Salmo trutta	Brown trout	158	52	17	227
Phoxinus phoxinus	Minnow	11	0	0	11

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, 2012 and 2015 are summarised in Table 1.2. Mean CPUE and BPUE for all fish species is illustrated in Figures 1.2 and 1.3.

Brown trout was the dominant species in terms of abundance (CPUE) and biomass (BPUE). Although the mean brown trout CPUE and BPUE fluctuated slightly over the three sampling years, these differences were not statistically significant (Fig. 1.2 and Fig. 1.3).

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Dan, 2009, 2012 and 2015

Scientific name	Common name	2009	2012	2015
			Mean CPUE	
Salmo trutta	Brown trout	0.255 (0.048)	0.368 (0.069)	0.251 (0.052)
Phoxinus phoxinus	Minnow	-	0.002 (0.002)	0.013 (0.006)
Anguilla anguilla	European eel*	0.056 (0.034)	0.044 (0.015)	-
			Mean BPUE	
Salmo trutta	Brown trout	24.314 (4.696)	40.554 (9.826)	27.513 (8.439)
Phoxinus phoxinus	Minnow	-	0.007 (0.005)	0.045 (0.022)
Anguilla anguilla	European eel*	18.161 (11.717)	9.444 (4.996)	-

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

*Eel CPUE and BPUE based on fyke nets only

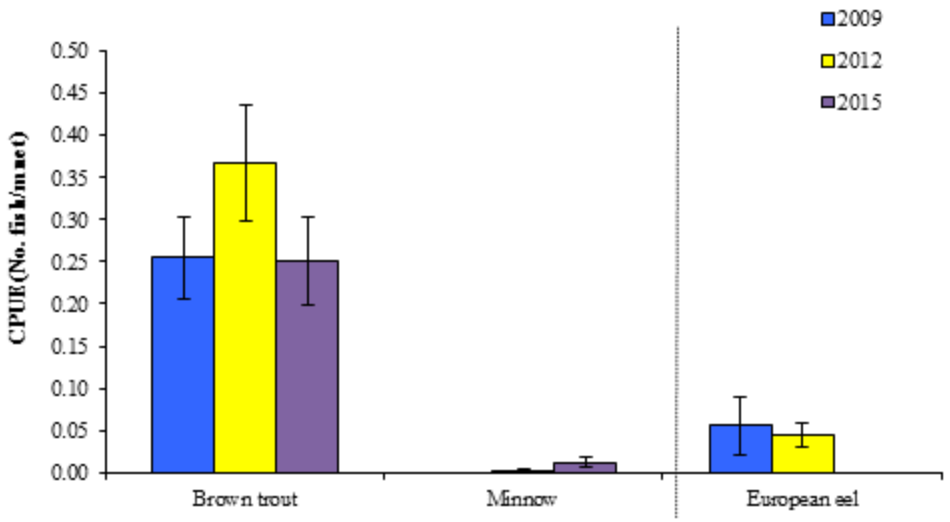

Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured in Lough Dan (Eel CPUE based on fyke nets only), 2009, 2012 and 2015

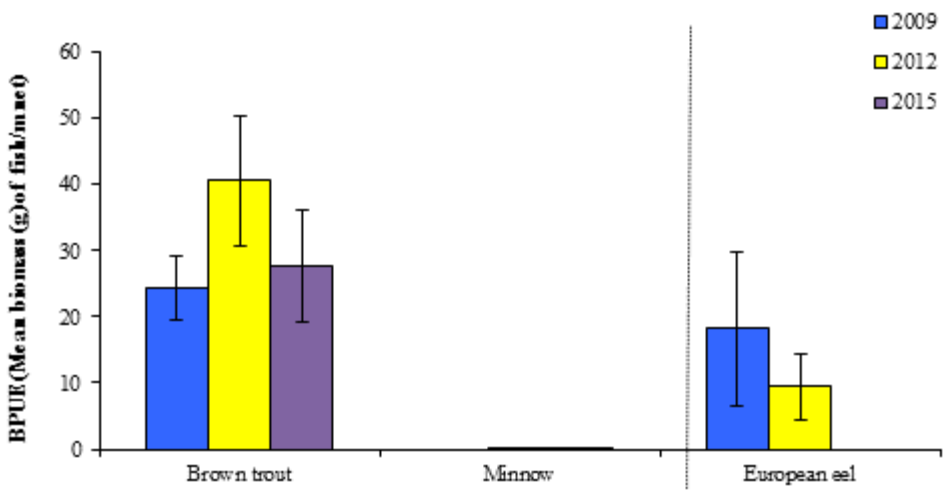

Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Lough Dan (Eel BPUE based on fyke nets only), 2009, 2012 and 2015

1.3.3 Length frequency distributions and growth

Brown trout captured during the 2015 survey ranged in length from 7.9cm to 64.5cm (mean = 19.5cm) (Fig. 1.4). Five age classes of brown trout were present, ranging from 1+ to 5+, with a mean L1 of 6.3cm (Table 1.3). The dominant age class was 3+ (Fig. 1.4). Mean brown trout L4 in 2015 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). Brown trout captured during the 2009 and 2012 surveys had similar length and age ranges, with some larger and older fish recorded in the 2012 and 2015 surveys (Fig.1.4).

Minnow were captured during the 2015 survey and they ranged in length from 5.3cm to 8.0cm.

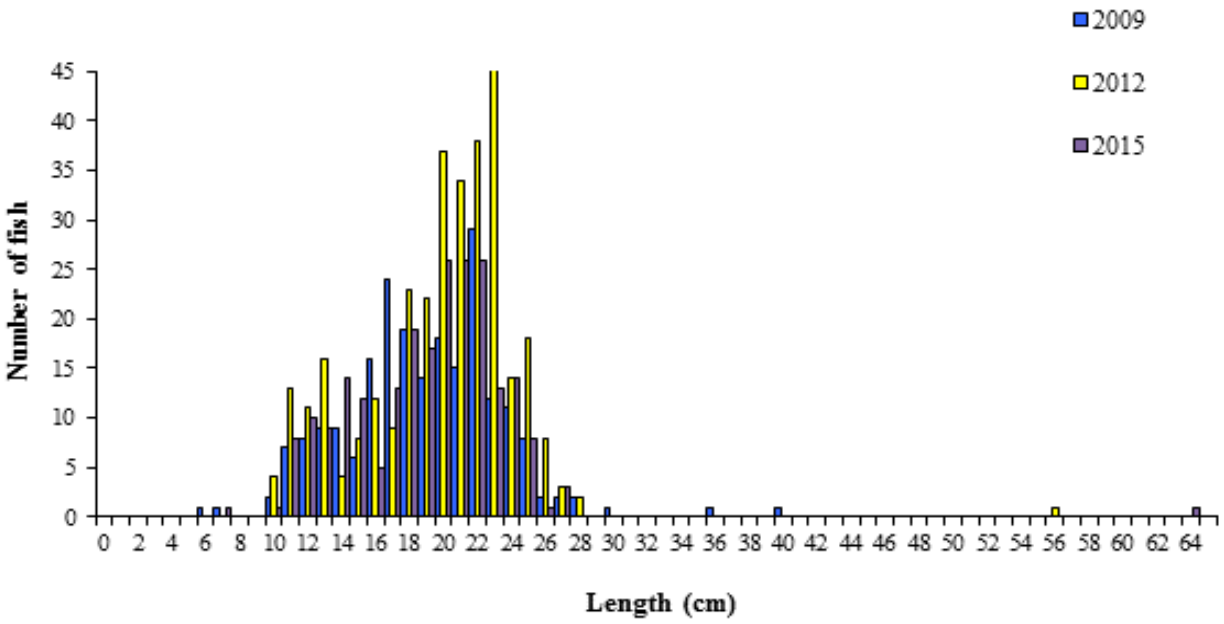

Fig. 1.4. Length frequency of brown trout captured on Lough Dan, 2009, 2012 and 2015

Table 1.3. Mean (±S.E.) brown trout length (cm) at age for Lough Dan, August 2015

	L_1	L_2	L_3	L_4	L_5	Growth Category
Mean (± S.E.)	6.3 (0.1)	12.9 (0.3)	18.8 (0.5)	22.2 (0.7)	24.7	Very slow
N	49	38	22	7	1	
Range	4.9-8.0	10.4-16.9	15.1-25.3	20.2-25.4	24.7-24.7	

1.3.4 Stomach and diet analysis

Feeding studies provide a good indication of the availability of food items and the angling methods that are likely to be successful. However, the value of stomach content analysis is limited unless undertaken over a long period as diet may change on a daily basis depending on the availability of food items. Adult trout usually feed principally on crustaceans (*Asellus* sp. and *Gammarus* sp.), insects (principally chironomid larvae and pupae) and molluscs (snails) (Kennedy and Fitzmaurice, 1971, O' Grady, 1981).

The food items recorded in a sub sample of trout captured during the survey were dominated by insect remains and unidentified winged insects (Fig 1.5).

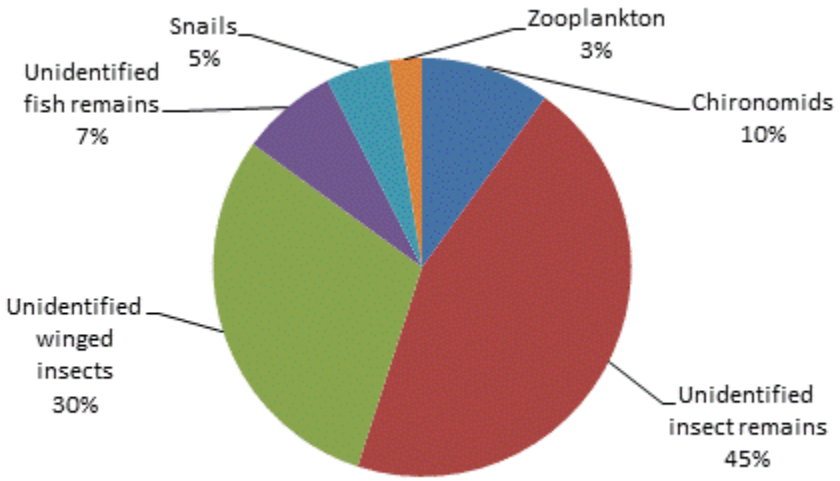

Fig 1.5. Diet of brown trout captured on Lough Dan 2015 (% occurrence) n=34

1.4 Summary and ecological status

Brown trout was the dominant species in terms of abundance (CPUE) and biomass (BPUE) captured in the survey gill nets during the 2015 survey.

The mean brown trout CPUE and BPUE fluctuated slightly over the three sampling occasions; however these differences were not statistically significant. Brown trout ranged in age from 1+ to 5+, indicating reproductive success in five of the previous six years. The dominant age class was 3+. 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 (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 Dan has been assigned an ecological status of High based on the fish populations present in 2015. The ecological fish status previously assigned to the lake in 2009 and 2012 survey data was Good.

In the 2010 to 2012 surveillance monitoring reporting period, the EPA assigned Lough Dan an overall ecological status of Moderate, based on all monitored physico-chemical and biological elements, including fish. This status classification will be revised during 2016.

1.5 References

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