Lough Beagh

Sampling Fish for the Water Framework Directive - Lakes 2008

The Central and Regional Fisheries Boards

ACKNOWLEDGEMENTS

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1.1 Introduction

Lough Beagh is situated in a remote valley in the Lackagh catchment, within the Glenveagh National Park, 24 kilometres north-west of Letterkenny, Co. Donegal. A visitor's centre is located near the northern shore of the lake and a castle is located on the eastern shore (Fig. 1.1). Lough Beagh is volcanic in origin. It is a long, narrow lake, approximately 6.5 kilometres in length and 0.8 kilometres wide. The lake is surrounded by mountains on three sides (including the Derryveagh and Glendowan Mountains on the south, east and west, Plate 1.1).

The lake has a surface area of 261ha, mean depth of 9.2m and a maximum depth of 46.5m. The altitude of the lake is 45.3m above sea level. The lake is categorised as 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 CaCO3). Lough Beagh has been classed as 2b (i.e. expected 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 lake holds brown trout, and occasional salmon and sea trout arrive into the lake during August (O' Reilly, 1987). Arctic char are also present in the lake. The lake was previously surveyed jointly by the Central Fisheries Board (CFB) and Northern Regional Fisheries Board (NRFB) in 1989 and 1995 and by the NRFB in 1994. In 2005, the lake was again surveyed using the current WFD lake sampling methodology as part of the cross border NS Share "Fish in lakes" project by the Agri-Food and Biosciences Institute Northern Ireland (AFBINI), the CFB and NRFB.

Plate 1.1. Aerial view of Lough Beagh (Glenveagh) looking southwest (Photo courtesy of CFB and No. 3 Operational Wing, Irish Air Corps [Aer Chór na hÉireann])

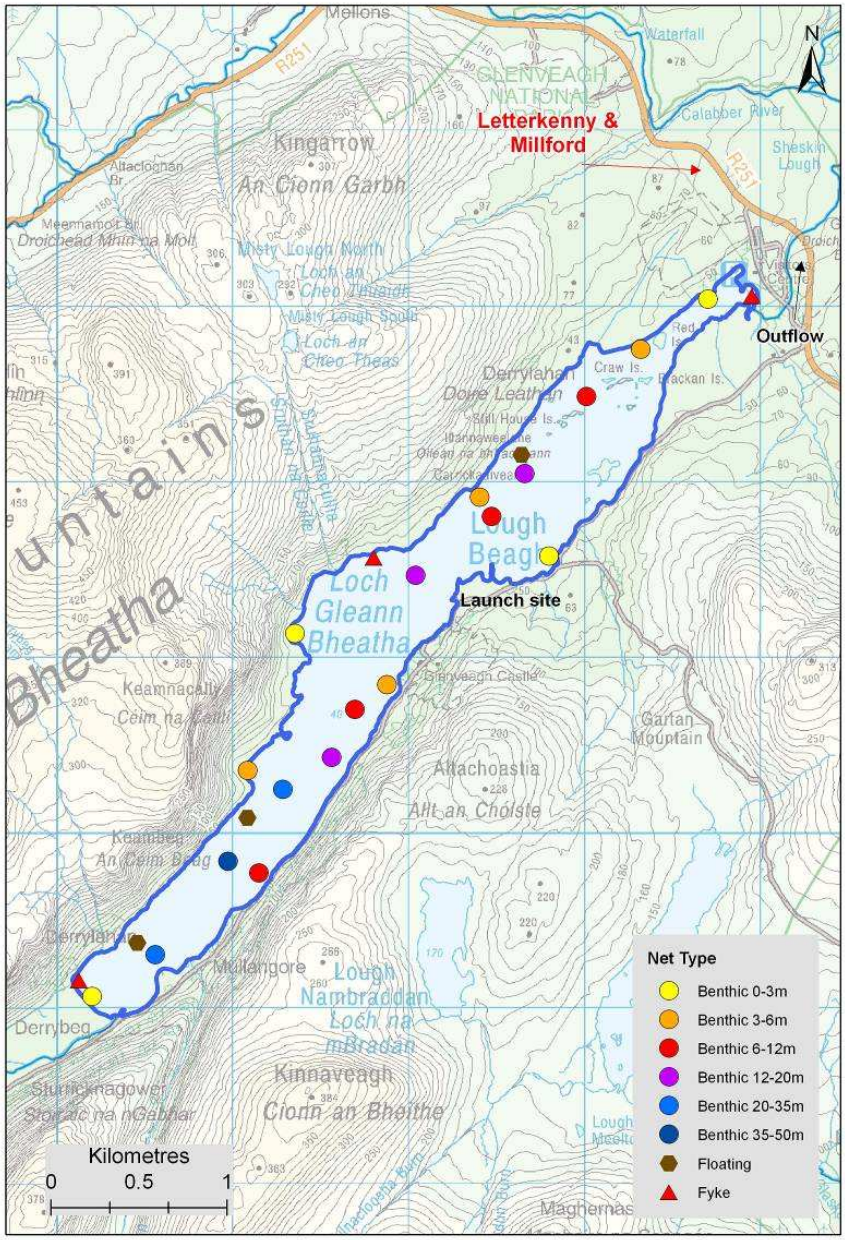

Fig. 1.1. Location map of Lough Beagh showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

The fish stock survey was conducted over two nights from the 11th to the 13th of August 2008. A total of three sets of Dutch fyke nets, 18 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) survey gill nets (4 @ 0-2.9m, 4 @ 3-5.9m, 4 @ 6-11.9m, 3 @ 12-19.9m, 2 @ 20-34.9m and 1 @ 35-49.9m) and three surface floating monofilament multi-mesh (12 panel, 5-55mm mesh size) survey gill nets were deployed randomly in the lake (24 sites) (Fig. 1.1). This netting effort is identical to the netting effort carried out in 2005. Nets were deployed in similar locations as those randomly selected

in the previous 2005 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 and scales were removed from brown trout and sea trout on site. 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 S*pecies richness*

A total of three fish species were captured in Lough Beagh during the survey. Sea trout were also captured and are counted separately as a different "variety" of brown trout. The number of each species captured by each gear type is shown in Table 1.1. A total of 142 fish were captured during the survey. Brown trout were the most common fish species taken in the gill nets followed by Arctic char. Eels were the most common species captured in the fyke nets.

Table 1.1. List of fish species recorded (including numbers captured) during the survey on Lough Beagh, July 2008

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	104	6	6	116
	Sea trout	2	0	0	2
Salvelinus alpinus	Arctic Char	18	1	0	19
Anguilla anguilla	Eel	0	0	5	5

1.3.2 *Fish abundance*

Fish abundance (mean CPUE) and biomass (mean BPUE) was 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. Mean CPUE is illustrated in Figure 1.2 and for comparative purposes, 2005 data is also displayed. Results indicate that there has been a decrease in mean CPUE and mean BPUE for all fish species between 2005 and 2008, however this was not statistically significant (except for brown trout biomass). Brown trout biomass (BPUE) was significantly higher in 2005 than 2008 (Mann Whitney U test) ($n = 48$, $z = -1.9857$, $p < 0.05$).

Table 1.2. Mean CPUE and Mean BPUE on Lough Beagh

Year	2005	2008
	Mean CPUE (mean no. of fish per m of net)	
Brown trout	0.224 (0.0499)	0.126 (0.0267)
Sea trout	0.003 (0.0019)	0.002 (0.0015)
Arctic char	0.058 (0.0162)	0.024 (0.0088)
3-spinned stickleback	0.003 (0.0016)	-
Eel	0.039 (0.0111)	0.028 (0.0111)
	Mean BPUE (mean weight (g) of fish/m of net)	
Brown trout	34.726 (6.869)*	12.794 (3.1127)
Sea trout	1.228 (0.8492)	0.647 (0.5892)
Arctic char	2.268 (0.6789)	0.669 (0.3143)
3-spinned stickleback	0.001 (0.0004)	-
Eel	14.806 (8.063)	7.033 (2.6664)

Note: *biomass significantly higher

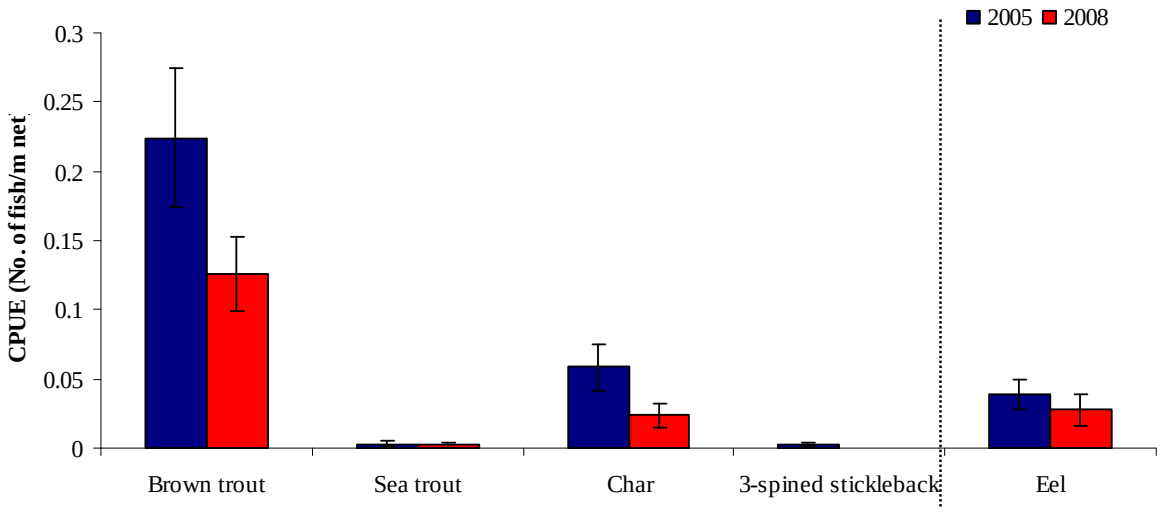

Fig. 1.2. Mean (±S.E.) CPUE on Lough Beagh (Eel CPUE based on fyke nets only)

1.3.3 *Length frequency distributions*

Brown trout ranged in length from 8.5cm to 36.0cm (mean = 20.3cm) in 2008 and this is similar to the length range recorded in 2005 (Fig. 1.3). . Arctic char ranged in length from 6.0cm to 17.1cm (mean = 13.3cm) in 2008. These lengths are similar to results obtained in 2005 when char had a mean length of 14.4cm (Fig. 1.4). Eels ranged in length from 41.5cm to 64.0cm. A small number of sea trout were also captured, one at 20.0cm and the other at 34.0cm.

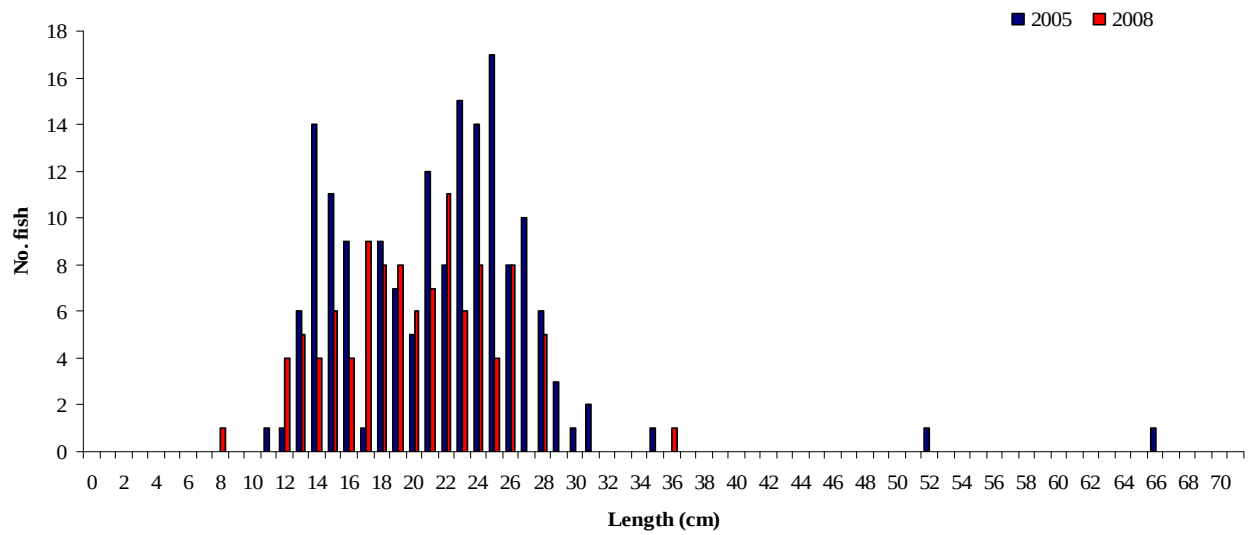

Fig. 1.3. Length frequency of brown trout captured on Lough Beagh

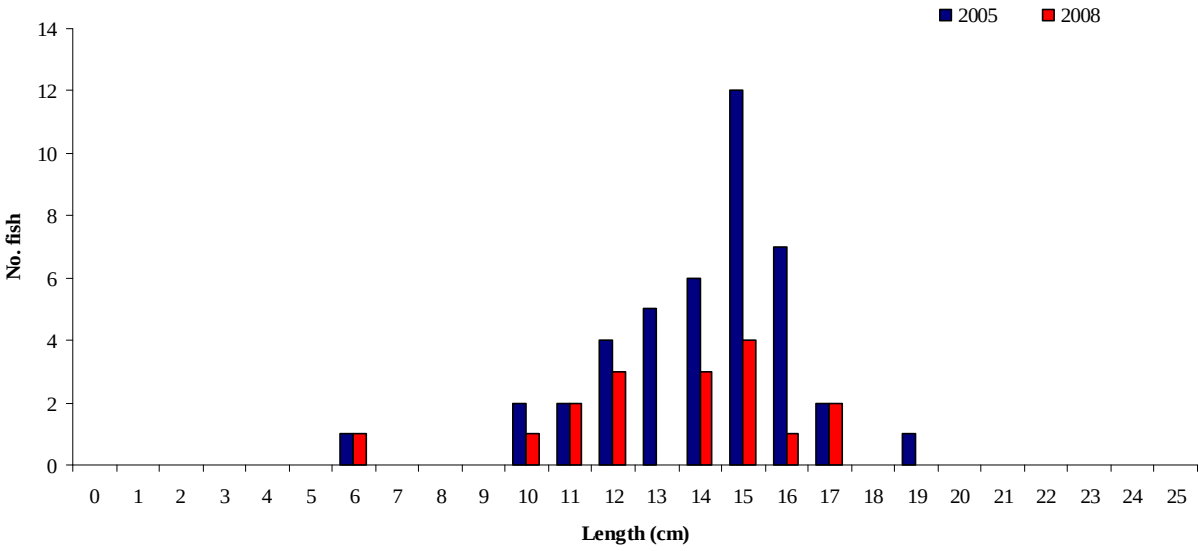

Fig. 1.4. Length frequency of arctic char captured on Lough Beagh

1.3.4 *Fish age and growth*

Brown trout ranged in age from 0+ to 5+ during the survey. Brown trout aged 2+ accounted for the largest proportion of the population captured during the survey (approximately 45%), followed by 3+ (25%) and 1+ (22%). Mean length at age four was 25.3cm (Table 1.3), indicating that the growth of brown trout in Lough Barra is slow (Kennedy and Fitzmaurice, 1971) Char ranged in age from 0+ to 3+.

Table 1.3. Mean (±SE) brown trout length at age (cm) for Lough Beagh, August 2008

	L_1	L_2	L_3	L_4	L_5
Mean	7.1 (0.19)	14.8 (0.31)	20.4 (0.47)	25.3 (1.07)	25.6 (0.09)
N	71	56	29	9	2
Range	3.7-9.7	8.9-19.4	15.1-25.3	21.1-32.4	25.5-25.6

1.4 Summary

Survey results reveal that brown trout was the dominant fish species in Lough Beagh, followed by arctic char and eels during the survey. A study carried out in 2005 (Kelly, *el al.*, 2007) found the same species composition as the current survey with the exception of 3-spined stickleback, which were present during the 2005 survey but were not captured in the current survey.

Mean CPUE for brown trout in the lake is below average when compared with similar low alkalinity lakes (Kelly *et al*., 2009). This result was also observed in the 2005 study when the lake was compared to other low alkalinity lakes at the time of the survey (Kelly *et al*., 2007). This would imply a relatively low abundance of brown trout in the lake. When compared to data from the 2005 survey, brown trout have decreased in abundance (mean CPUE) and biomass (mean BPUE). Mean BPUE for brown trout captured in the lake during 2005 was significantly higher than that from the 2008 survey.

Brown trout length at age at L1 and L2 was similar to other low alkalinity lakes surveyed in 2008, e.g. Lough Brin, Co. Kerry and Lough Easky, Co. Sligo (Kelly *et al*., 2009) and mean length at age at L4, indicates that growth is slow (Kennedy and Fitzmaurice, 1971). A similar pattern of growth was also observed in Glencullin lake, Co. Galway (Kelly *et al*., 2009).

Only three low alkalinity lakes surveyed during 2008 contained Arctic char, with Lough Beagh having the median CPUE of the three. The CPUE of Arctic char in Lough Beagh, a salmonid species that is a listed in the Irish Red Data Book for fish as vulnerable (Whilde, 1983), however, was over two times greater than the lowest CPUE value which was recorded in Lough Caragh. There was a decrease in Arctic char CPUE between 2005 and 2008 and, as such, it is suggested that the fish population should be closely monitored (minimum of three yearly as required under WFD Surveillance Monitoring).

Lough Beagh had the second lowest mean CPUE value for eels within the low alkalinity lakes sampled in 2008 (Kelly *et al*., 2009).

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 new WFD multimetric fish classification tool has been developed for the island of Ireland (Ecoregion 17) using AFBINI and CFB data (Kelly *et al*., 2008). Using this tool and expert opinion, Lough Beagh has been assigned a draft classification of high status for fish in 2008. In 2005, the lake

was also classed as high; therefore Lough Beagh has maintained its high ecological status over the last three years. The EPA has divided Lough Beagh into an upper and lower section. In an interim draft classification Lough Beagh Lower was assigned good status and Lough Beagh Upper was assigned high status. This is based on physico-chemical parameters and biotic elements such as macroinvertebrates and macrophytes.

1.5 Reference*s*

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