



**Sampling Fish for the
Water Framework
Directive**

Lakes 2013

Glencar Lough



lascach Intíre Éireann
Inland Fisheries Ireland

Water Framework Directive Fish Stock Survey of Glencar Lough, August 2013

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

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1.1 Introduction

Glencar Lough is situated in the Drumcliff catchment in Co. Sligo, approximately 7km north-east of Sligo town (Plate 1.1, Fig. 1.1). It is 3.2km in length and 0.8km wide, with Glencar waterfall located in the north-east corner (Fig. 1.1). Glencar Lough forms part of the Benbulbin, Gleniff and Glencar Special Area of Conservation. The lake and the waterfall are of particular botanical interest within the SAC site (NPWS, 2003). The lake has a surface area of 114.7ha, a mean depth > 4m and a maximum depth of 19m. The lake is categorised as typology class 12 (as designated by the EPA for the Water Framework Directive), i.e. deep (>4m), greater than 50ha and high alkalinity (>100mg/l CaCO₃).

The lake holds a small stock of brown trout and gets a good run of sea trout and salmon (O' Reilly, 2007). Sea trout average 0.7kg in weight. The largest brown trout taken in recent years weighed 2.9kg and the largest salmon was 10kg (O' Reilly, 2007).

Glencar Lough was previously surveyed in 2007 and 2010 as part of the Water Framework Directive surveillance monitoring programme (Kelly and Connor, 2007 and Kelly *et al.*, 2011). During the 2010 survey, brown trout were found to be the dominant species present in the lake. Sea trout, salmon, three-spined stickleback, flounder, minnow and eels were also captured during the survey.



Plate 1.1. Glencar Lough

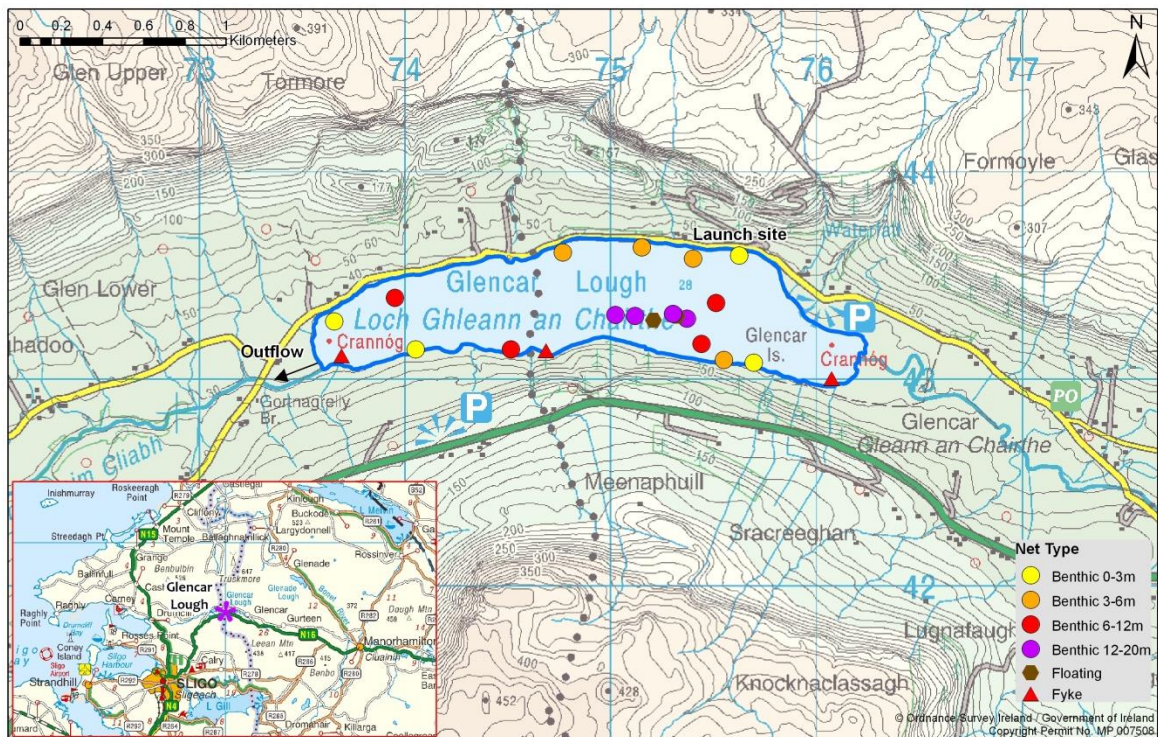


Fig. 1.1. Location map of Glencar Lough showing net locations and depths of each net (outflow is indicated on map)

1.2 Methods

Glencar Lough was surveyed over two nights from the 28th to the 30th of August 2013. A total of three sets of Dutch fyke nets, 16 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 and 4 @ 12-19.9m) and two floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake (21 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, sea trout and salmon. 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 six fish species (sea trout are included as a separate ‘variety’ of trout) were recorded in Glencar Lough in August 2013, with 253 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 three-spined stickleback, eels and sea trout. During the previous surveys in 2010 and 2007, the same species composition was recorded.

Table 1.1. Number of each fish species captured by each gear type during the survey on Glencar Lough, August 2013

Scientific name	Common name	Number of fish captured			Total
		Benthic mono multimesh gill nets	Surface mono multimesh gill nets	Fyke nets	
<i>Salmo trutta</i>	Brown trout	120	24	5	149
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	48	0	1	49
<i>Salmo trutta</i>	Sea trout	12	0	1	13
<i>Platichthys flesus</i>	Flounder	4	0	0	4
<i>Phoxinus phoxinus</i>	Minnow	4	0	0	4
<i>Salmo salar</i>	Salmon	1	0	0	1
<i>Anguilla anguilla</i>	European eel	1	0	32	33

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 the 2010 and 2013 surveys are summarised in Table 1.2. Mean CPUE and BPUE for all species is illustrated in Figure 1.2 and 1.3.

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

Although the mean brown trout CPUE and BPUE fluctuated between the sampling years, these differences were not statistically significant (Table 1.2; Fig 1.2 and 1.3).

The mean sea trout CPUE and BPUE increased every year from 2007 to 2013, however, only the mean BPUE was significantly higher in 2013 compared to 2010 and 2007 (Mann-Whitney, $P < 0.05$) (Table 1.2; Figs 1.2 and 1.3).

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured in Glencar Lough, 2007, 2010 and 2013

Scientific name	Common name	2007	2010	2013
Mean CPUE				
<i>Salmo trutta</i>	Brown trout	0.291 (0.085)	0.133 (0.035)	0.233 (0.043)
<i>Salmo trutta</i>	Sea trout	0.006 (0.002)	0.008 (0.004)	0.021 (0.006)
<i>Salmo salar</i>	Salmon	0.003 (0.002)	0.002 (0.001)	0.002 (0.002)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.220 (0.107)	0.037 (0.013)	0.006 (0.005)
<i>Platichthys flesus</i>	Flounder	0.008 (0.003)	0.005 (0.003)	0.006 (0.004)
<i>Phoxinus phoxinus</i>	Minnow	0.030 (0.024)	0.002 (0.001)	0.077 (0.025)
<i>Anguilla anguilla</i>	European eel*	0.024 (0.015)	0.044 (0.022)	0.178 (0.073)
Mean BPUE				
<i>Salmo trutta</i>	Brown trout	16.571 (3.329)	11.616 (2.868)	15.984 (2.707)
<i>Salmo trutta</i>	Sea trout	2.350 (1.117)	2.847 (1.759)	8.937 (3.096)
<i>Salmo salar</i>	Salmon	4.353 (3.301)	6.142 (4.510)	3.589 (3.589)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.882 (0.430)	0.046 (0.015)	0.033 (0.024)
<i>Platichthys flesus</i>	Flounder	1.779 (0.910)	2.357 (1.471)	2.208 (1.528)
<i>Phoxinus phoxinus</i>	Minnow	0.151 (0.118)	0.014 (0.010)	0.079 (0.029)
<i>Anguilla anguilla</i>	European eel*	4.667 (2.963)	4.711 (2.442)	24.178 (10.107)

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

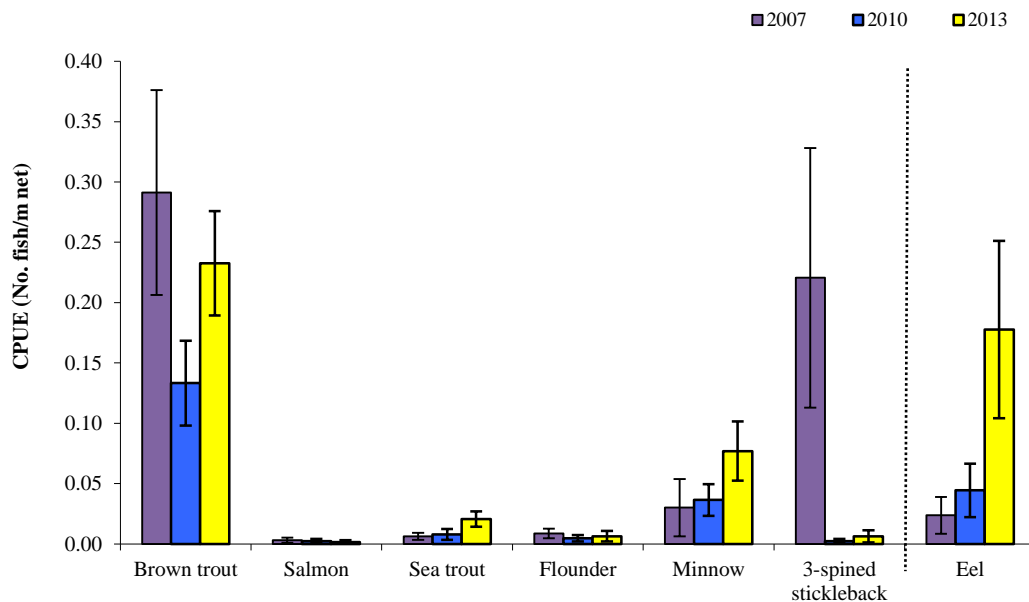


Fig. 1.2. Mean (\pm S.E.) CPUE for all fish species captured in Glencar Lough (Eel CPUE based on fyke nets only), 2007, 2010 and 2013

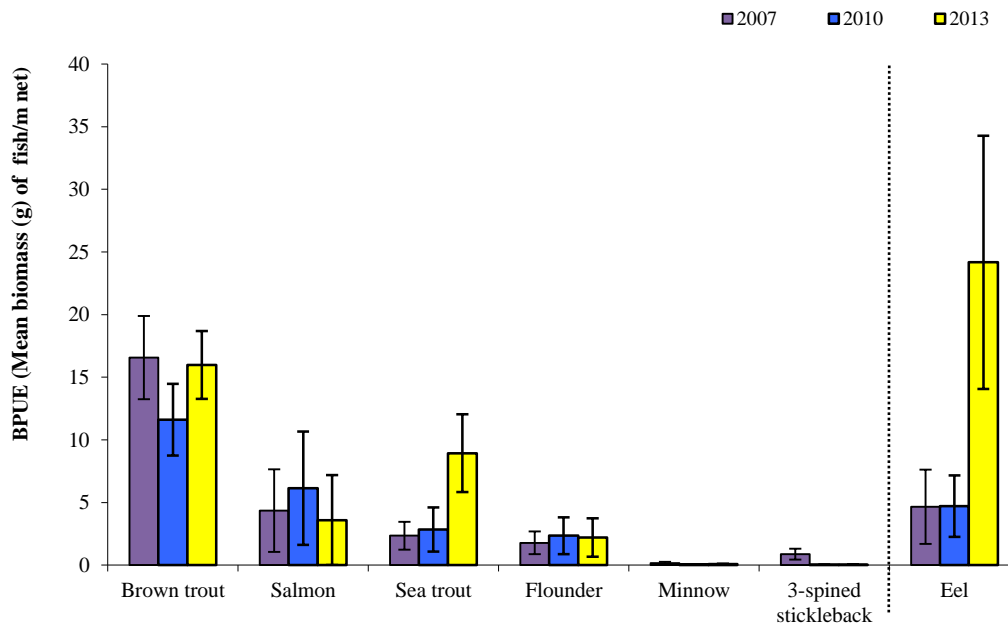


Fig. 1.3. Mean (\pm S.E.) BPUE for all fish species captured in Glencar Lough (Eel BPUE based on fyke nets only), 2007, 2010 and 2013

1.3.3 Length frequency distributions and growth

Brown trout captured during the 2013 survey ranged in length from 8.0cm to 31.1cm (mean = 17.0cm) (Fig. 1.4) with four age classes present, ranging from 1+ to 4+, with a mean L1 of 5.4cm (Table 1.3). The dominant age class was 1+ (Fig 1.4). Brown trout L4 was 26.6cm indicating a 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 2010 and 2007 surveys had a similar length range, age range and growth rate (Fig. 1.4). The dominant age class was 1+ and 2+ in 2007 and 2010 respectively (Fig. 1.4).

Eels captured during the 2013 survey ranged in length from 31.5cm to 54.2cm (mean = 43.3cm) (Fig.1.5). Three-spined stickleback ranged in length from 2.5cm to 6.0cm, flounder ranged in length from 22.5.0cm to 37.4cm and minnow ranged from 6.1cm to 8.3cm. One salmon measuring 60.5cm was also captured and aged 2.1+.

Sea trout captured during the 2013 survey had a length range of 21.5cm to 48.5cm and were aged 2.0+, 2.1+, 3.0+ and 3.1+, with a mean L1 of 5.9cm.

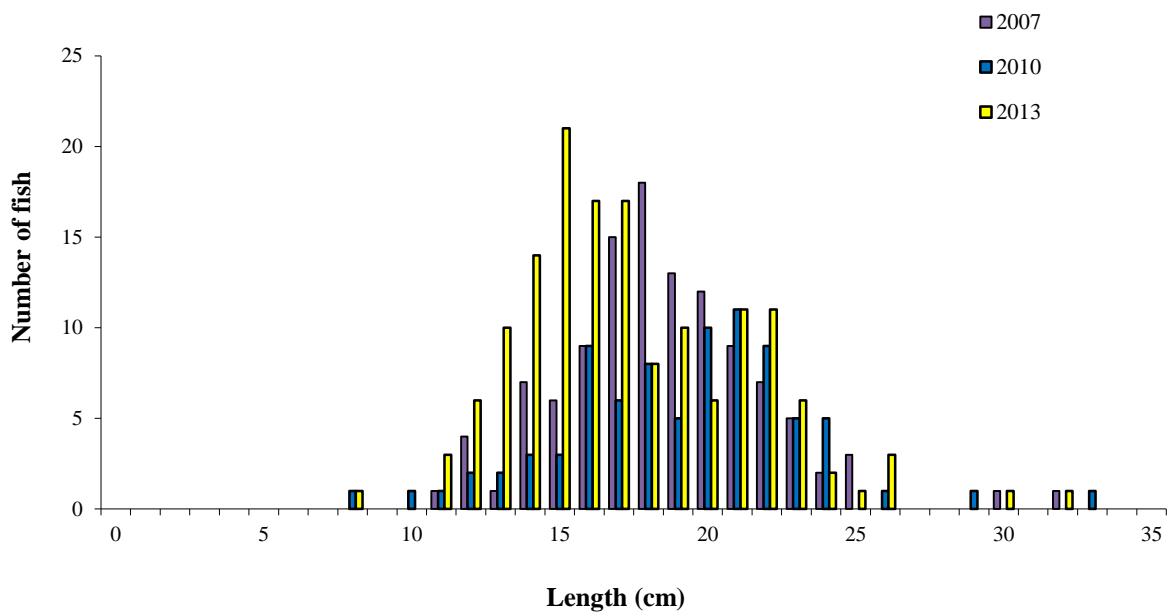


Fig. 1.4. Length frequency of brown trout captured on Glencar Lough, 2007, 2010 and 2013

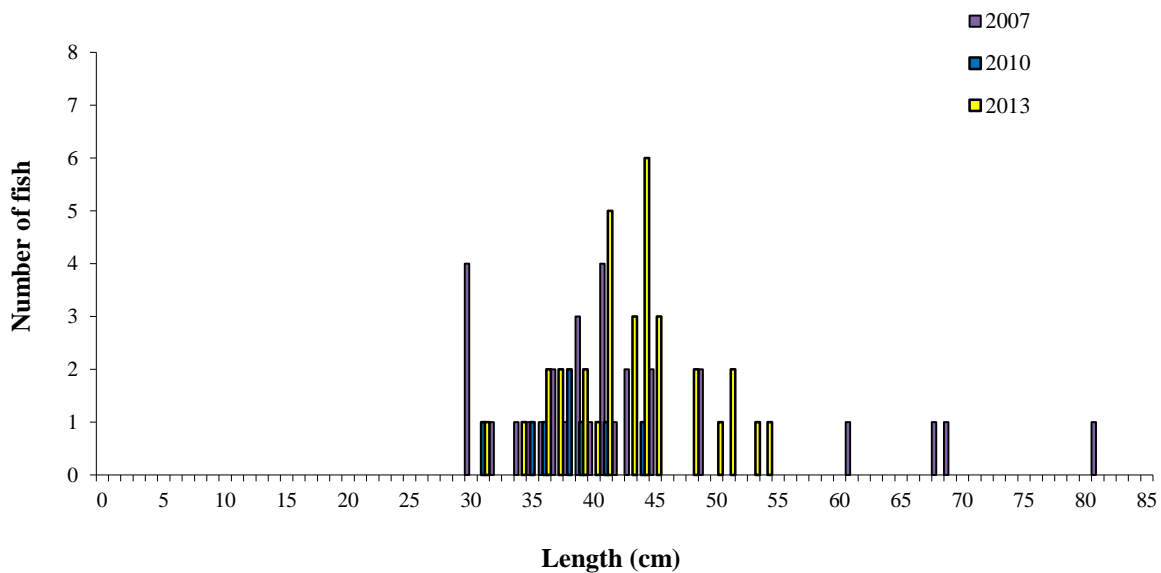


Fig. 1.5. Length frequency of eels captured on Glencar Lough, 2007, 2010 and 2013

Table 1.3. Mean (\pm SE) brown trout length (cm) at age for Glencar Lough, August 2013

	L ₁	L ₂	L ₃	L ₄
Mean	5.4 (0.1)	13.4 (0.4)	19.0 (0.5)	26.6 (1.7)
N	88	52	21	2
Range	3.0-8.5	8.1-18.9	13.6-23.0	24.9-28.3

1.4 Summary

Brown trout was the dominant species in terms of abundance (CPUE) and biomass (BPUE) captured in the survey gill nets during the 2013 survey.

Although the mean brown trout CPUE and BPUE fluctuated between the sampling years, these differences were not statistically significant. Brown trout ranged in age from 1+ to 4+, indicating reproductive success in four of the previous five years, no 0+ fish were captured. The dominant age class was 1+. Length at age analyses revealed that brown trout in the lake exhibit a slow rate of growth according to the classification scheme of Kennedy and Fitzmaurice (1971). The mean sea trout BPUE was significantly higher in 2013 compared to 2007 and 2010.

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, Glencar Lough has been assigned an ecological status of High for 2007, 2010 and 2013 based on the fish populations present.

In the 2010 to 2012 surveillance monitoring reporting period, the EPA assigned Glencar Lough an overall draft ecological status of Moderate, based on all monitored physico-chemical and biological elements, including fish.

1.5 References

- 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.
- Kelly, F.L., Harrison A., Connor, L., Morrissey, E., Wogerbauer, C., Matson, R., Feeney, R., O'Callaghan, R. and Rocks, K. (2011) *Water Framework Directive Fish Stock Survey of Glencar Lough, September 2010*. Inland Fisheries Ireland.
- Kelly, F., Harrison A., Connor, L., Matson, R., Morrissey, E., Wogerbauer, C., Feeney, R., O'Callaghan, R. and Rocks, K. (2011) *Sampling Fish for the Water Framework Directive – Summary Report 2010*. Inland Fisheries Ireland.
- Kelly, F.L., Harrison, A.J., Allen, M., Connor, L. and Rosell, R. (2012) Development and application of an ecological classification tool for fish in lakes in Ireland. *Ecological Indicators*, **18**, 608-619.
- 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.
- NPWS (2003) *Site synopsis: Ben Bulbin, Gleniff and Glenade Complex. Site code: 000623*. Site Synopsis report, National Parks and Wildlife Service.
- O' Reilly (2007) *Loughs of Ireland. A Flyfisher's Guide*. 4th Edition. Merlin Unwin Books.

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