National Research Survey Programme

Lakes 2020

Glencar Lough

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Fish Stock Survey of Glencar Lough, September 2020

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Cover photo: Netting survey on Lough Talt © 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). The lake 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 Benbulben, 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 categorized 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, 2010 and 2013 as part of the Water Framework Directive surveillance monitoring programme (Kelly and Connor, 2007 and Kelly *et al*., 2011 and 2014). During the 2013 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.

This report summarises the results of the 2020 fish stock survey carried out on the lake, as part of the Water Framework Directive surveillance monitoring programme.

Plate 1.1. Glencar Lough

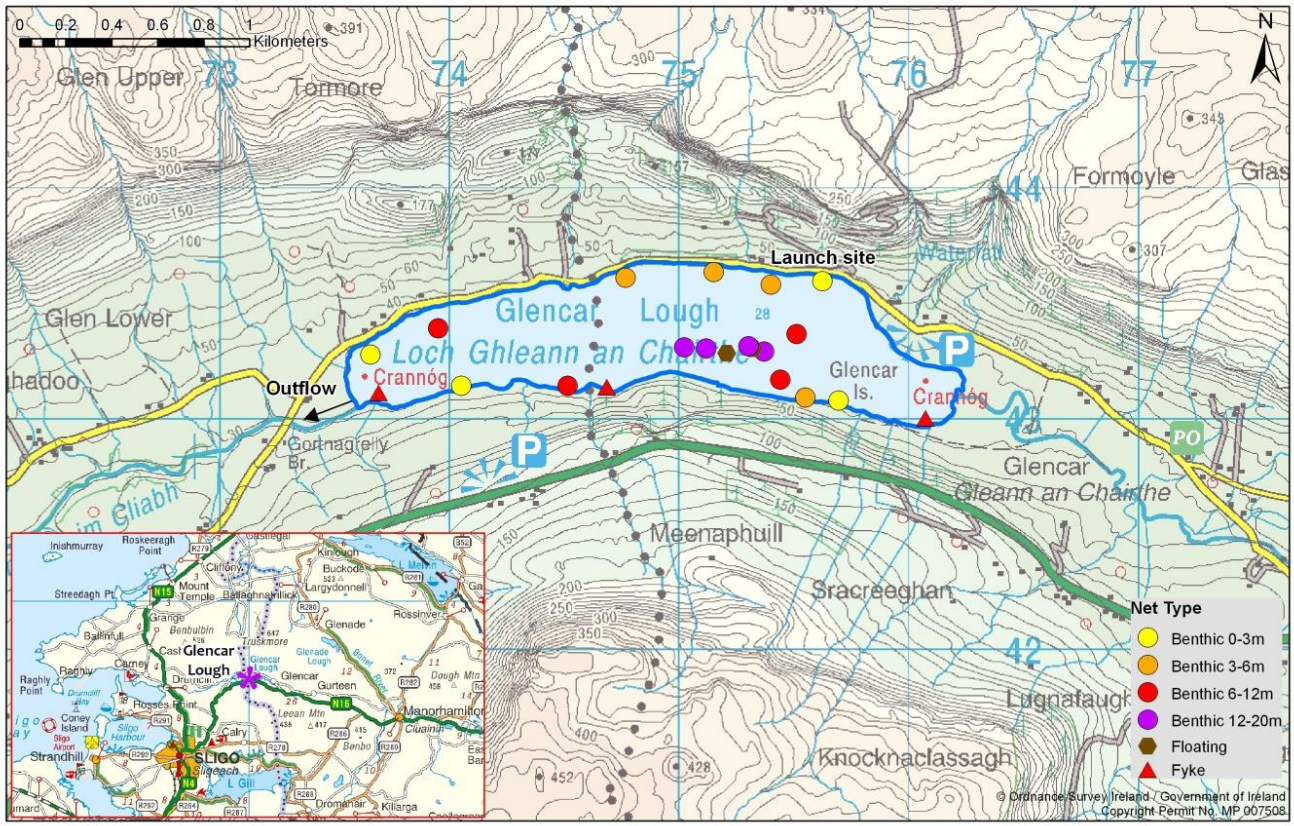

Fig. 1.1. Location map of Glencar Lough showing net locations and depths of each net (outflow is indicated on map)

1.2 Methods

1.2.1 Netting methods

Glencar Lough was surveyed over two nights from the 28th to the 30th of September 2020. 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 and sea 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 retained for further analysis. Fish were frozen immediately after the survey and transported back to the IFI laboratory for later dissection.

1.2.2 Fish diet

Total stomach contents were inspected and individual items were counted and identified to the lowest taxonomic level possible. The percentage frequency occurrence (%FO) of prey items were then calculated to identify key prey items (Amundsen *et al.*, 1996).

$$\mathbf{FO}_i = \left(\frac{\boldsymbol{N_i}}{\boldsymbol{N}}\right) * \mathbf{100}$$

Where:

$\mathbf{FO}_i$ is the percentage frequency of prey item i,

$\boldsymbol{N_i}$ is the number of fish with prey i in their stomach,

$\boldsymbol{N}$ is total number of fish with stomach contents.

1.2.3 Biosecurity - disinfection and decontamination procedures

Procedures are required for disinfection of equipment 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 in IFI when moving between water bodies.

1.3 Results

1.3.1 Species Richness

Five fish species were recorded in Glencar Lough in September 2020. A total of 243 fish were 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, flounder, salmon and eels. During the previous surveys in 2007, 2010 and 2013, the same species composition was recorded. However, no seat trout or minnow were captured in 2020, having been captured on all previous sampling occasions.

Table 1.1. Number of each fish species captured by each gear type during the survey on Glencar Lough, September 2020

Scientific name	Common name	Number of fish captured			
		BM CEN	FM CEN	Fyke nets	Total
Salmo trutta	Brown trout	166	7	10	183
Gasterosteus aculeatus	Three-spined stickleback	52	0	2	54
Platichthys flesus	Flounder	4	0	0	4
Salmo salar	Salmon	1	0	0	1
Anguilla anguilla	European eel	0	0	1	1

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.

<u>Brown trout</u>

Brown trout was the dominant species in terms of abundance (CPUE) and biomass (BPUE). Mean CPUE fluctuated slightly across the four survey occasions but remained relatively stable overall (Table 1.2; Figs.1.2 and 1.3). Mean BPUE showed a large increase in 2020 compared to previous surveys (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, 2013 and 2020

Scientific name	Common name	2007	2010	2013	2020
				Mean CPUE	
Salmo trutta	Brown trout	0.291 (0.085)	0.133 (0.035)	0.233 (0.043)	0.283 (0.071)
	Sea trout	0.006 (0.002)	0.008 (0.004)	0.021 (0.006)	-
Salmo salar	Salmon	0.003 (0.002)	0.002 (0.001)	0.002 (0.002)	0.002 (0.002)
Gasterosteus aculeatus	Three-spined stickleback	0.220 (0.107)	0.037 (0.013)	0.006 (0.005)	0.084 (0.030)
Platichthys flesus	Flounder	0.008 (0.003)	0.005 (0.003)	0.006 (0.004)	0.006 (0.004)
Phoxinus phoxinus	Minnow	0.030 (0.024)	0.002 (0.001)	0.077 (0.025)	-
Anguilla anguilla	European eel*	0.024 (0.015)	0.044 (0.022)	0.178 (0.073)	0.006 (0.006)
				Mean BPUE	
Salmo trutta	Brown trout	16.571 (3.329)	11.616 (2.868)	15.984 (2.707)	35.113 (8.121)
	Sea trout	2.350 (1.117)	2.847 (1.759)	8.937 (3.096)	-
Salmo salar	Salmon	4.353 (3.301)	6.142 (4.510)	3.589 (3.589)	2.987 (2.987)
Gasterosteus aculeatus	Three-spined stickleback	0.882 (0.430)	0.046 (0.015)	0.033 (0.024)	0.092 (0.032)
Platichthys flesus	Flounder	1.779 (0.910)	2.357 (1.471)	2.208 (1.528)	2.017 (1.696)
Phoxinus phoxinus	Minnow	0.151 (0.118)	0.014 (0.010)	0.079 (0.029)	-
Anguilla anguilla	European eel*	4.667 (2.963)	4.711 (2.442)	24.178 (10.107)	1.621 (1.621)

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 (Connor et al., 2017).

*Eel CPUE and BPUE based on fyke nets only

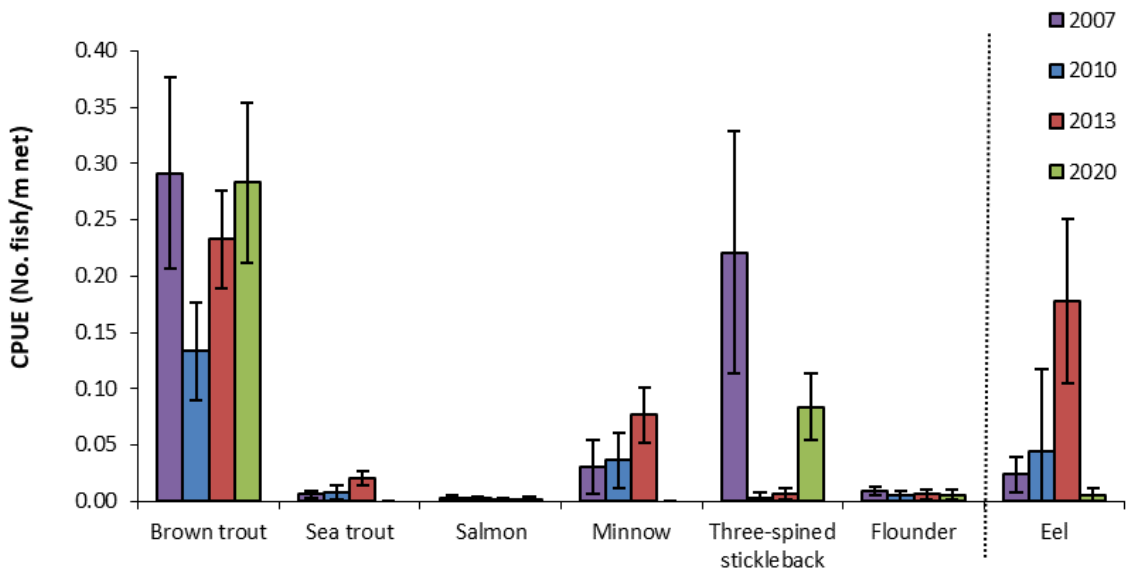

Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured in Glencar Lough (Eel CPUE based on fyke nets only) 2007, 2010, 2013 and 2020

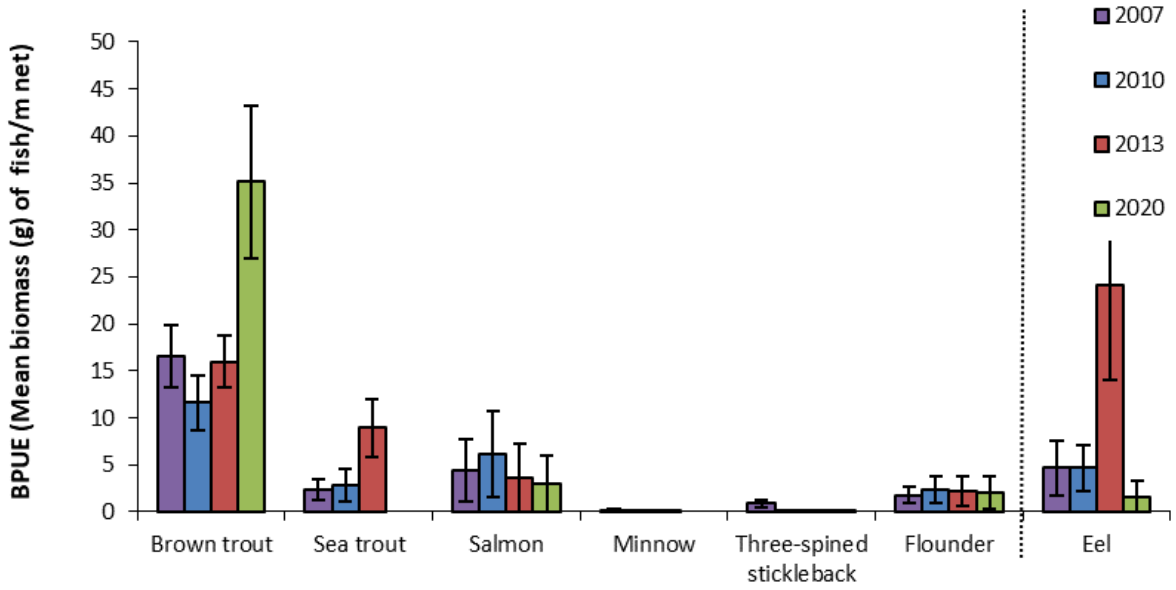

Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Glencar Lough (Eel CPUE based on fyke nets only) 2007, 2010, 2013 and 2020

1.3.3 Length frequency distributions and growth

Brown trout

Brown trout captured during the 2020 survey ranged in length from 7.5cm to 57.0cm (mean = 19.2cm) (Fig. 1.4). Five age classes were present, ranging from 0+ to 4+. The dominant age class was 1+. Mean length of brown trout after their first year (L1) was estimated at 8.2cm (Table 1.3). Mean brown trout L4 in 2020 was 36.8 indicating a very fast rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971) (Table 1.3). The length and age range of brown trout was similar across all four surveys. However, some larger fish were captured in 2020 compared to earlier surveys (Fig 1.4).

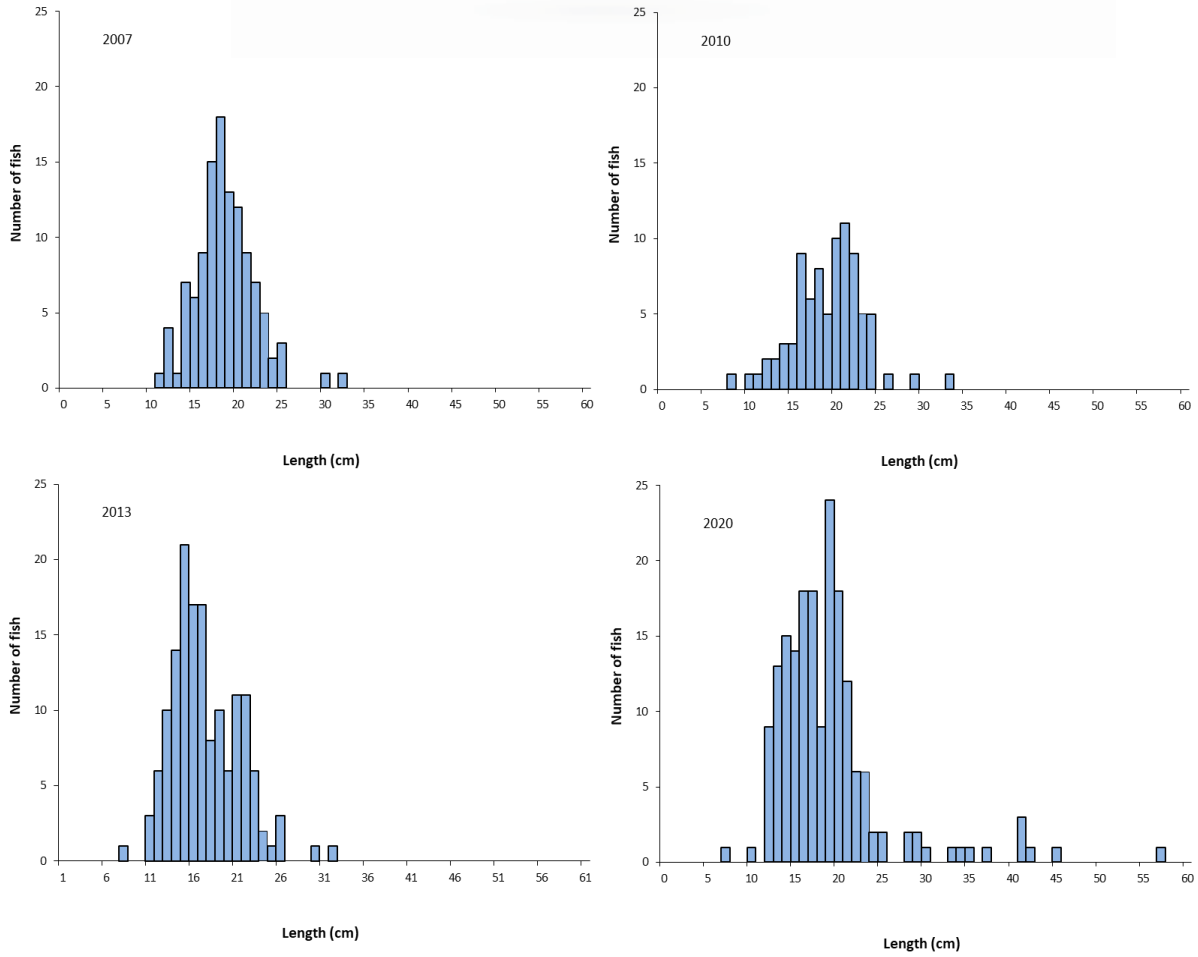

Fig. 1.4. Length frequency of brown trout captured on Glencar Lough, 2007, 2010, 2013 and 2020

Table 1.3. Mean (±S.E.) brown trout length (cm) at age for Lough Glencar September 2020

	L_1	L_2	L_3	L_4	Growth Category
Mean (±S.E.)	8.2 (0.2)	17.1 (0.4)	26.2 (1.2)	36.7 (0.6)	Very fast
N	84	35	9	2	
Range	4.4-13.1	11.2-24.0	19.6-32.3	36.2-37.3	

Other fish species

A single eel measuring 55.0cm was captured in the 2020 survey. One adult salmon was captured measuring 56.5cm. Four flounder ranging from 18.0cm to 37.5cm were captured. Three-spined stickleback (n = 54) ranged from 3.0cm to 6.0cm.

1.3.4 Stomach and diet analysis

The stomach contents of a subsample of brown trout captured during the survey were examined and are presented below.

Brown trout

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). A total of 78 stomachs were examined. Of these, 49 were empty. Of the 29 stomachs which contained food, invertebrates were the only dietary item in 15 (51.7%) stomachs. A total of 12 (41.4%) stomachs contained fish. Fish were the sole dietary item found in 8 (27.6 %) stomachs, while fish were found together with invertebrates in 4 (13.8%) stomachs. Zooplankton and unidentified digested material (DM) were each recorded in one (3.4%) brown trout stomach (Fig. 1.5).

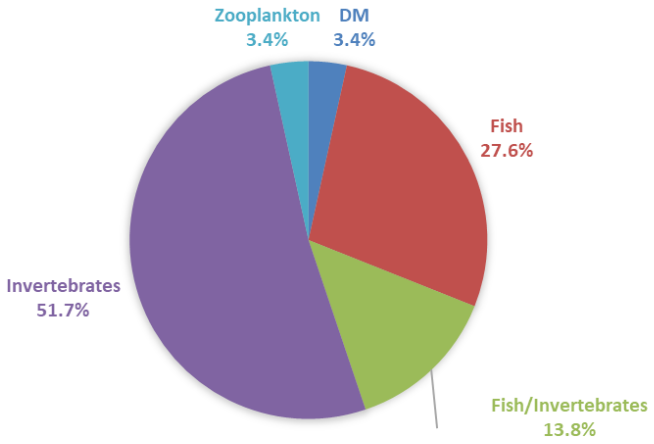

Fig 1.5 Diet of brown trout (n=29) captured on Glencar Lough, 2020 (% FO)

1.4 Summary and ecological status

A total of five fish species were recorded in Glencar Lough in September 2020.

Brown trout was the dominant species in terms of abundance (CPUE) and biomass (BPUE) captured in the survey gill nets during the 2020 survey. The mean brown trout CPUE remained relatively stable over the four sampling occasions. There was an apparent increase in mean BPUE in 2020 compared to previous surveys, probably driven by the larger brown trout that were captured in 2020 compared to previous surveys. Brown trout ranged in age from 0+ to 4+. The dominant age class was 1+. This cohort represented c. 56% of the sample aged. Relatively few fish older than 3+ were recorded. Length at age analyses revealed that brown trout in the lake exhibit a very fast 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 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*., 2012b).

Using the FIL2 classification tool, Glencar Lough was assigned an ecological status of Good for 2020 based on the fish populations present. In previous years, the lake was assigned a fish status of High in 2007, 2010 and 2013 (Fig 1.6).

In the 2013 to 2018 surveillance monitoring reporting period, the EPA assigned Glencar Lough an overall ecological status of Moderate.

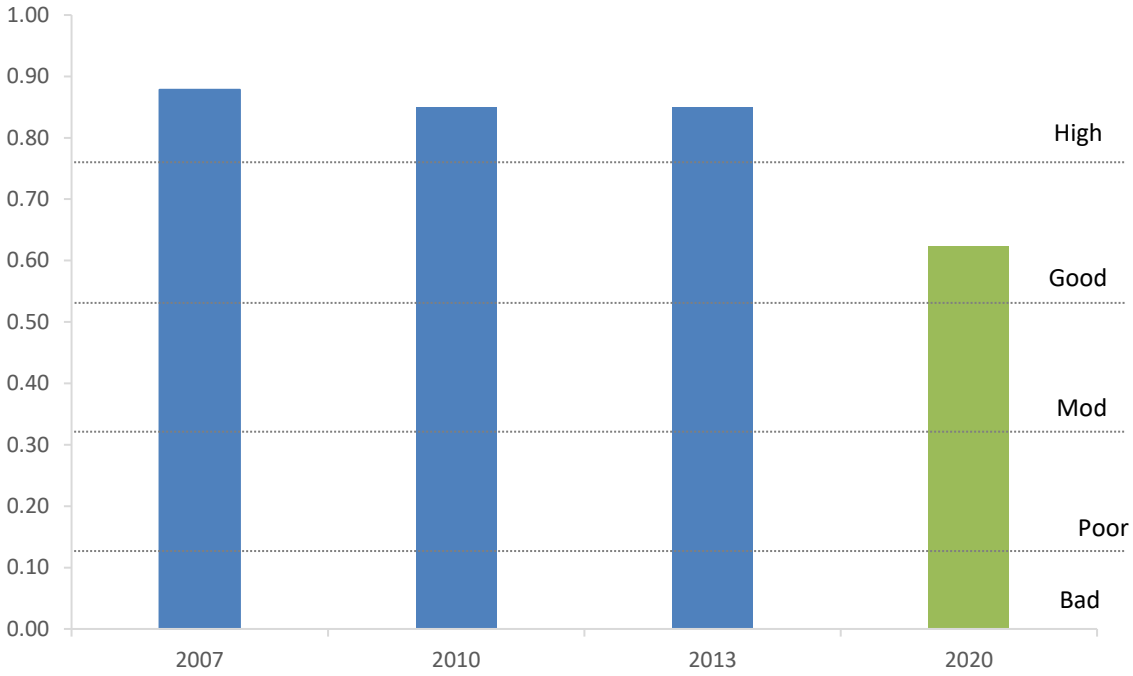

Fig. 1.6. Fish ecological status of Glencar Lough, in 2007, 2010, 2013 and 2020

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