National Research Survey Programme

Lakes 2020

Lough Anure

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Iascach Intíre Éireann
Inland Fisheries Ireland

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Fish Stock Survey of Lough Anure, August 2020

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

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1.1 Introduction

Lough Anure is situated adjacent to the village of Loch Anure, approximately 8km north-east of Dungloe, Co. Donegal (Plate 1.1, Fig. 1.1). The lake is the largest in the Rosses system and drains into the sea through the River Crolly (Gweedore River). Lough Anure is very rocky, with a surface area of 156ha, a mean depth of only 2m and maximum depth of 12m. The lake is categorised as typology class 2 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. shallow (<4m), greater than 50ha and low alkalinity (<20mg/l CaCO3). The lake was classed as 1a (i.e. at risk of failing 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 Rosses Anglers Association and the Electricity Supply Board both control the fishing rights to Lough Anure and it is considered to be one of the best trout fishing lakes in the area (O' Reilly, 2007) with brown trout averaging approximately 0.25kg and numerous fish weighing up to 0.5kg. The lake also gets a good run of sea trout and occasional salmon from July (O' Reilly, 2007).

This lake was surveyed in 2006 as part of the NSSHARE Fish in Lakes Project (Kelly *et al*., 2007) and in 2009, 2012 and 2015 as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al*., 2010, 2013 and 2016). In all year's, brown trout was found to be the dominant species, followed by eels and minnow.

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. Lough Anure

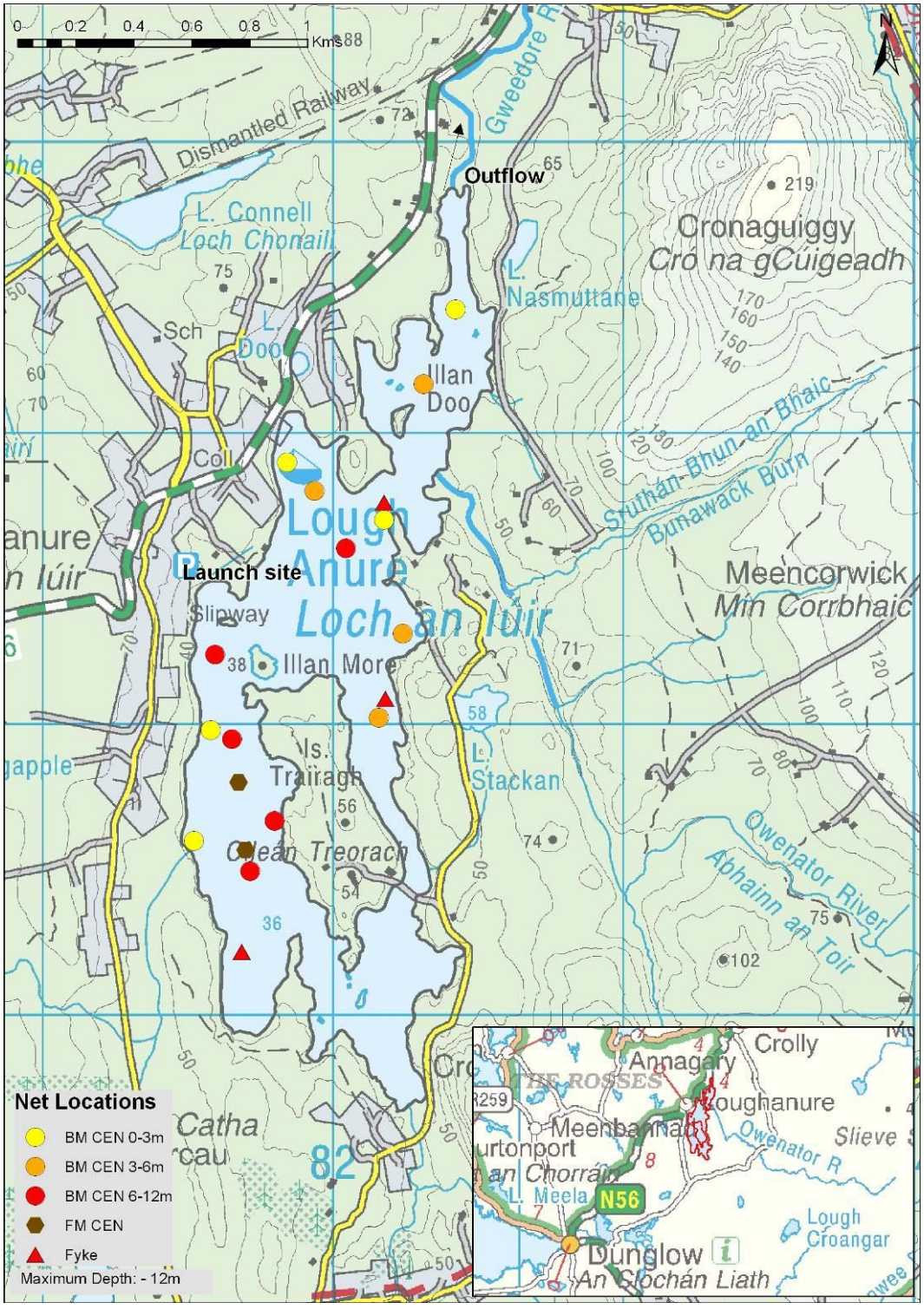

Fig. 1.1. Location map of Lough Anure showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

1.2.1 Netting methods

Lough Anure was surveyed over two nights between the 26th and 28th of August 2020. A total of three sets of Dutch fyke nets (fyke), 14 benthic monofilament multi-mesh (BM CEN) (12 panel, 5-55mm mesh knot to knot) CEN standard survey gill nets (5 @ 0-2.9m, 4 @ 3-5.9m, 5 @ 6-11.9m) and two 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 (19 sites). Nets were deployed in the same locations as were randomly selected in the previous surveys in 2009, 2012 and 2015. 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 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,

N is total number of fish with stomach contents.

1.2.3 *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*

A total of four fish species were recorded on Lough Anure in August 2020. A total of 242 fish were captured (Table 1.1). Brown trout was the most abundant fish species recorded, followed by minnow, eels and salmon. During the previous surveys in 2009, 2012 and 2015 the same species composition was recorded except salmon, which were present during the 2012 survey but were not captured in 2009 (Kelly *et al.*, 2010, 2013 and 2016).

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

Scientific name	Common name	Number of fish captured			
		BM CEN	FM CEN	Fyke	Total
Salmo trutta	Brown trout	175	3	15	193
Phoxinus phoxinus	Minnow	40	0	0	40
Salmo salar	Salmon	1	0	0	1
Anguilla anguilla	European eel	0	0	8	8

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 2009, 2012, 2015 and 2020 surveys are summarised in Table 1.2. Mean CPUE and BPUE for all species is illustrated in Figures 1.2 and 1.3.

Brown trout

Brown trout was the dominant species in terms of abundance (CPUE) and biomass (BPUE). Between 2009 and 2015 the CPUE and BPUE of brown trout in Lough Anure increased. Between 2015 and 2020 the CPUE of brown trout in Lough Anure decreased; however BPUE increased in this time (Table 1.2; Fig 1.2 and 1.3).

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Anure, 2009, 2012, 2015 and 2020

Scientific name	Common name	2009	2012	2015	2020
			Mean CPUE		
Salmo trutta	Brown trout	0.154 (0.032)	0.286 (0.047)	0.362 (0.064)	0.330 (0.068)
Phoxinus phoxinus	Minnow	0.044 (0.030)	0.081 (0.030)	0.047 (0.020	0.007 (0.024)
Salmo salar	Salmon	-	0.001 (0.001)	0.009 (0.006)	0.002 (0.002)
*Anguilla anguilla**	European eel	0.206 (0.059)	0.128 (0.068)	0.033 (0.017)	0.044 (0.006)
			Mean BPUE		
Salmo trutta	Brown trout	13.509 (3.619)	31.746 (5.843)	37.766 (6.857)	42.743 (9.207)
Phoxinus phoxinus	Minnow	0.226 (0.154)	0.215 (0.080)	0.134 (0.059)	0.026 (0.026)
Salmo salar	Salmon	-	0.031 (0.031)	2.114 (2.018)	0.177 (0.060)
*Anguilla anguilla**	European eel	28.917 (8.298)	25.706 (14.955)	4.839 (2.419)	9.316 (2.219)

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

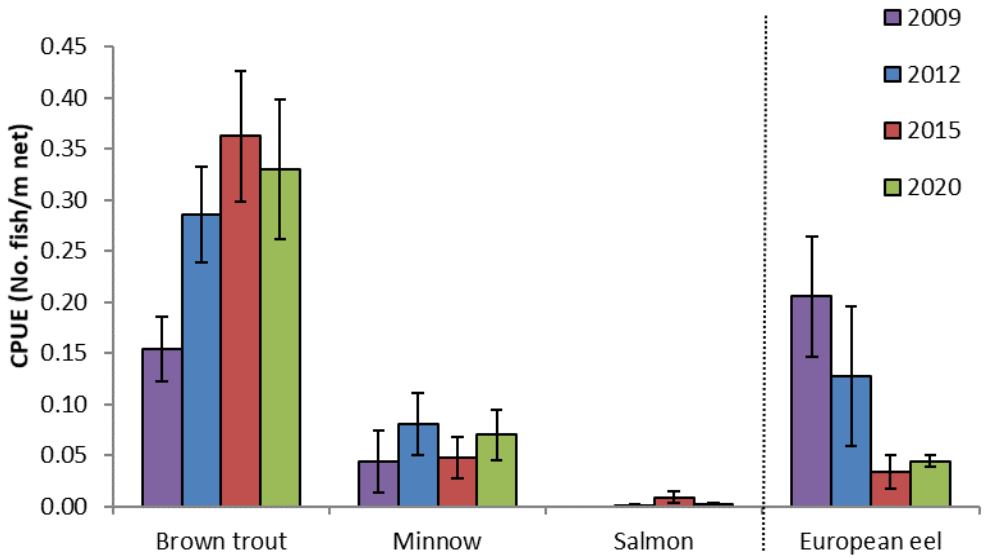

Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured in Lough Anure (Eel CPUE based on fyke nets only), 2009, 2012, 2015 and 2020

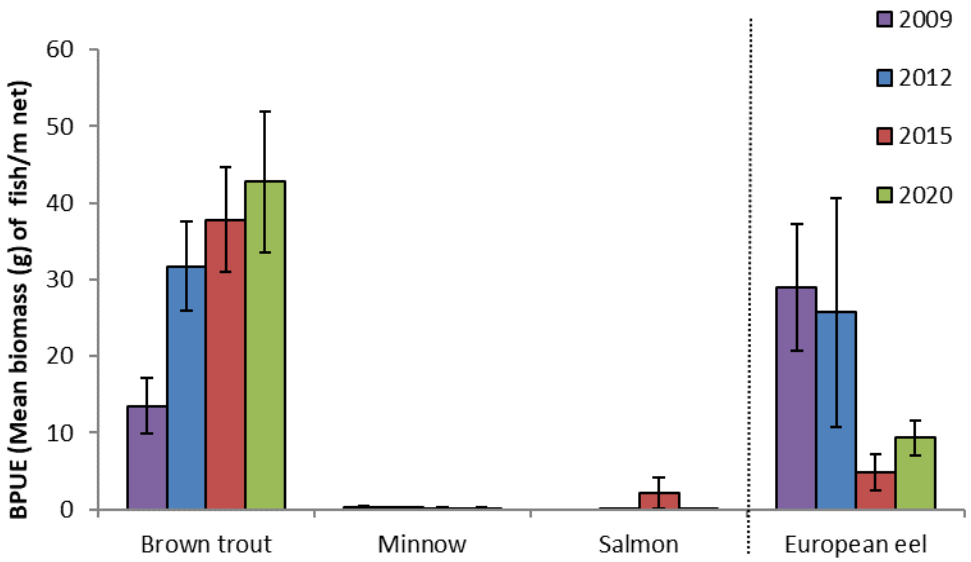

Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Lough Anure (Eel BPUE based on fyke nets only), 2009, 2012, 2015 and 2020

1.3.3 Length frequency distributions and growth

Brown trout captured during the 2020 survey ranged in length from 10.0cm to 49.0cm (mean = 21.4cm) (Fig. 1.4). Five age classes were present, ranging from 0+ to 4+. The dominant age class was 2+. Mean length of one year old brown trout (L1) was estimated at 7.7cm (Table 1.3). Mean brown trout L4 in 2020 was 26.2cm indicating a slow rate of growth in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971) (Table 1.3). Brown trout captured in 2020 had similar length and age ranges, compared to previous surveys, although some larger and older fish were recorded in the 2020 survey (Fig.1.4).

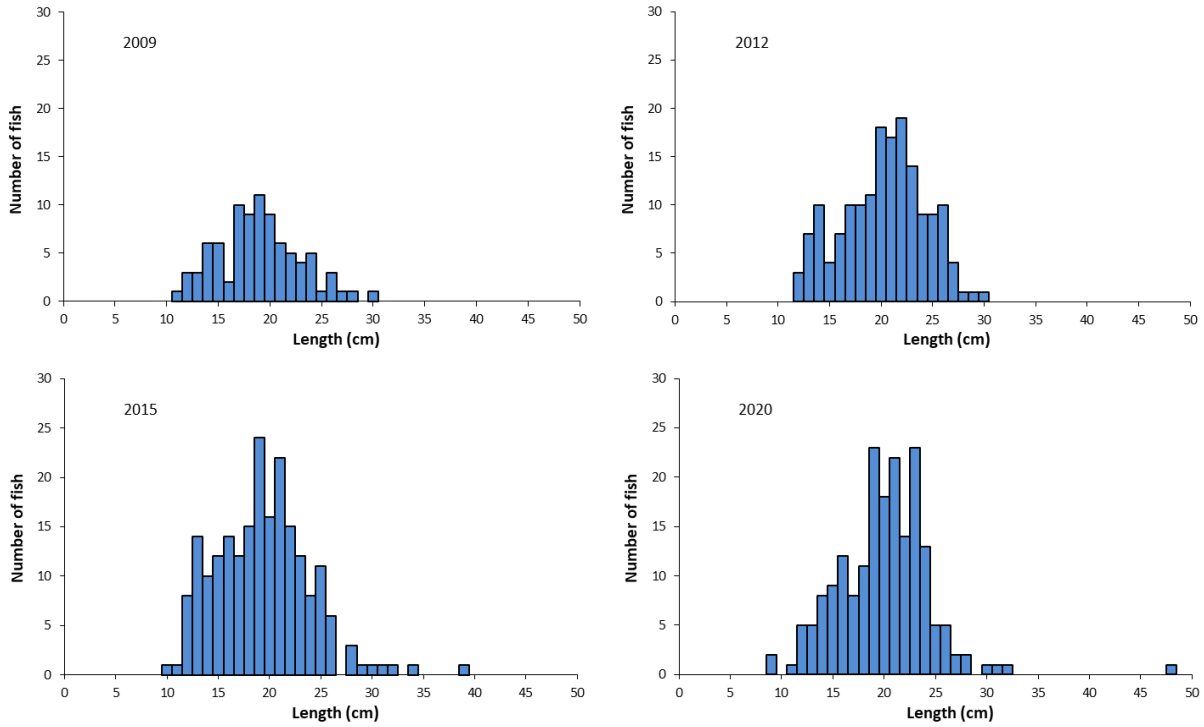

Fig. 1.4. Length frequency of brown trout captured on Lough Anure, 2009, 2012, 2015 and 2020

Table 1.3. Mean (±S.E.) brown trout length (cm) at age for Lough Anure, August 2020

	L_1	L_2	L_3	L_4	Growth Category
Mean (± S.E.)	7.7 (0.2)	16.3 (0.3)	19.2 (0.3)	26.2 (1.6)	Slow
N	86	56	22	2	
Range	4.1-10.8	11.8-20.1	19.4-26.5	24.6-27.9	

Other fish species

One juvenile salmon aged 0+ and measuring 10.6cm was captured during the 2020 survey. Eels ranged in length from 42.0cm to 61.5cm and minnow ranged in length from 5.0cm to 7.6cm.

1.3.4 Stomach and diet analysis

Dietary analysis can provide insight into potential prey resource use and competition use within and between species. It can also give an indication of the availability of food items and the angling methods

that are likely to be successful. 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 100 stomachs were examined. Of these 51 were found to contain no prey items. Of the remaining 49 stomachs containing food, 24 (49%) contained fish, of these 13 contained solely fish, 10 contained fish and invertebrates and 1 contained fish, invertebrates and zooplankton. 11 (22.5%) brown trout contained solely invertebrates, 10 (20.4%) solely zooplankton and four (8.1%) invertebrates and zooplankton (Fig. 1.5).

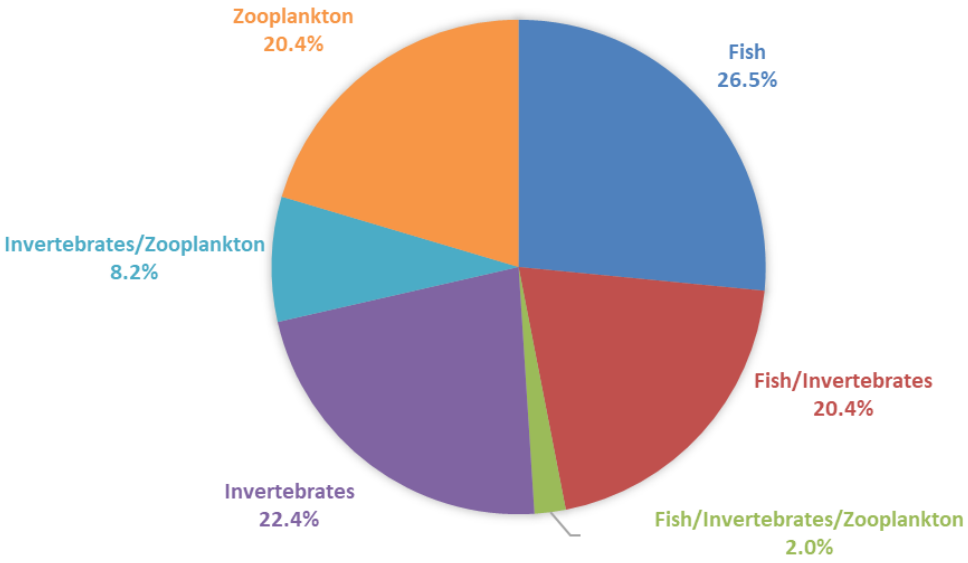

Fig 1.5. Diet of brown trout (n=49) captured on Lough Anure, August 2020 (% FO)

1.4 Summary and ecological status

A total of four fish species were recorded in Lough Anure in August 2020. Brown trout was the dominant species in terms of abundance (CPUE) and biomass (BPUE) captured in the survey gill nets.

Both CPUE and BPUE for brown trout have remained relatively stable during recent surveys. Brown trout ranged in age from 0+ to 4+, indicating reproductive success in the previous five years. The dominant age class was 2+. 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).

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, Lough Anure has been assigned an ecological status of Good for 2020 based on the fish populations present. The lake was also assigned a fish status of Good in 2015. In 2006, 2009 and 2012, Lough Anure was assigned a High fish status.

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

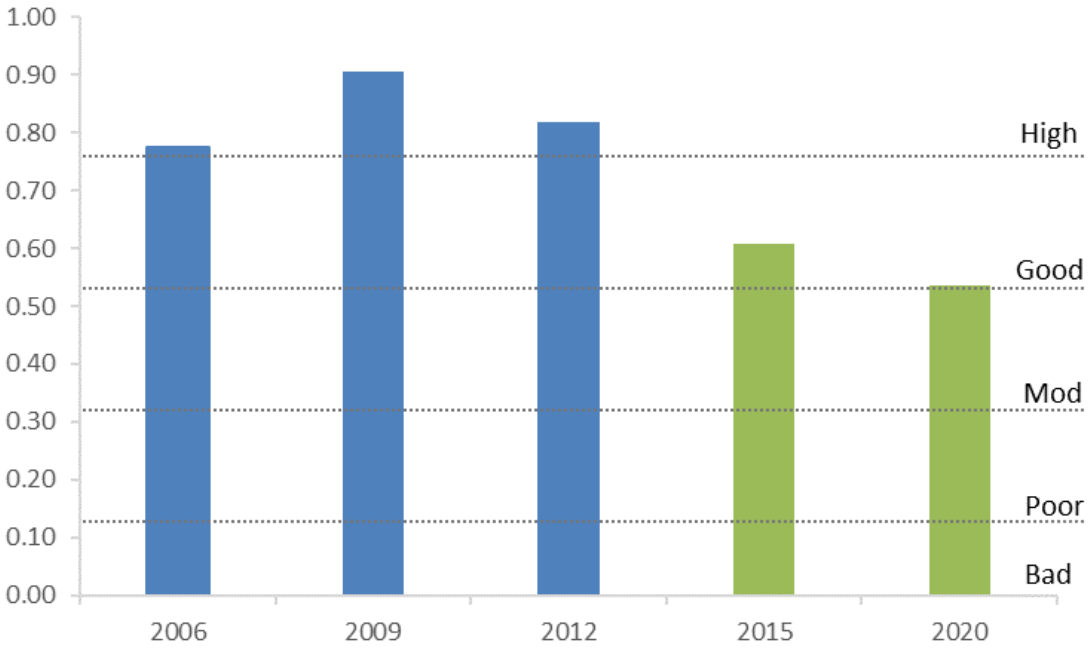

Fig. 1.6. Fish ecological status of Lough Anure, 2007, 2012, 2015 and 2020

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IFI Dublin,
3044 Lake Drive,
Citywest Business Campus,
Dublin 24,
Ireland

www.fisheriesireland.ie
dublin@fisheriesireland.ie
+353 1 8842 600