National Research Survey Programme

Lakes 2016

Glenade Lough

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Fish Stock Survey of Glenade Lough, August 2016

Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

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

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1.1 Introduction

Glenade Lough is situated at the top of the Bonet catchment in Co. Leitrim, in a valley between the Arroo and Benbulben Mountain ranges, approximately 9km north-west of Manorhamilton (Plate 1.1, Fig. 1.1). The lake has a surface area of 73.3ha, a mean depth <4m and a maximum depth of 11.5m. It is categorised as typology class 6 (as designated by the EPA for the Water Framework Directive), i.e. shallow (<4m), greater than 50ha and moderately alkaline (20-100mg/l CaCO3).

Glenade Lough has been designated as a Special Area of Conservation (NPWS, 1999). The underlying geology of the lough is composed of carboniferous limestone and shales. The lake is naturally eutrophic, a habitat listed on Annex I of the E.U. Habitats Directive. The water is clear, well aerated and relatively nutrient poor, and the shoreline is generally stony or sandy (NPWS, 1999). There is a diverse range of pondweeds present in the lake, which include *Potamogeton praelongus, P. pusillus, P. lucens* and *P. natans* (NPWS, 1999). Glenade Lough is home to a large population of the native white-clawed crayfish (*Austropotamobius pallipes*), a species listed on Annex II of the E.U. Habitats Directive. The lake is also home to the plant species quillwort (*Isoetes lacustris*) and slender naiad (*Najas flexilis*), a species also listed on Annex II of the E.U. Habitats Directive (NPWS, 1999). Surrounding the lake are areas of deciduous woodland which includes species such as hazel (*Corylus avellana*), ash (*Fraxinus excelsior*), alder (*Alnus glutinosa*) oak (*Quercus petraea*), beech (*Fagus sylvatica*), rhododendron (*Rhododendron ponticum*) and sycamore (*Acer pseudoplatanus)* (NPWS, 1999).

Glenade 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, roach were found to be the dominant species present in the lake followed closely by perch. Pike and eels were also captured during the survey.

Plate 1.1. Glenade Lough

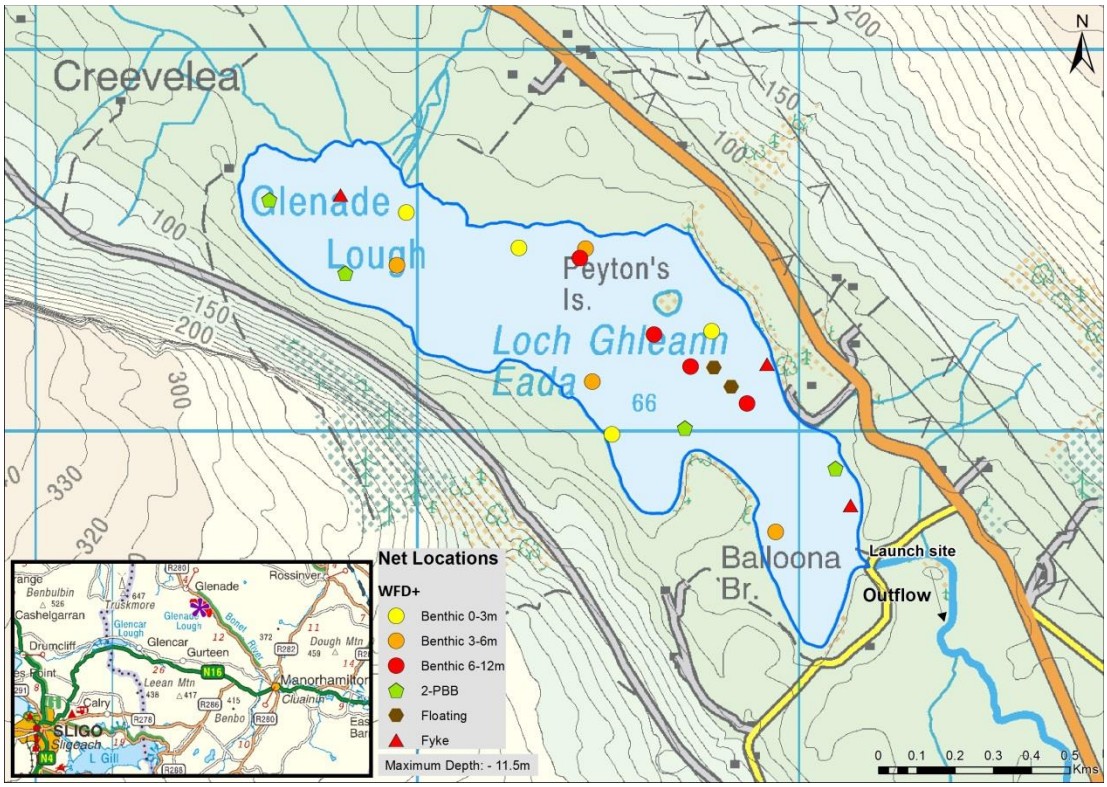

Fig. 1.1. Location map of Glenade Lough showing net locations and depths of each net (outflow is indicated on map)

1.2 Methods

1.2.1 Netting methods

Glenade Lough was surveyed over two nights from the 10th to the 12th of August 2016. A total of three sets of Dutch fyke nets, 12 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (BM CEN) (4 @ 0-2.9m, 4 @ 3-5.9m and 4 @ 6-11.9m) and two floating benthic monofilament multi-mesh (FM CEN) (12 panel, 5-55mm mesh size) CEN standard survey gills net were deployed in the lake (17 sites). The netting effort was supplemented using four two-panel benthic braided (63.5mm and 88.9mm mesh knot to knot) survey gill nets (2-PBB).

The nets were deployed in the same locations as were randomly selected in the previous survey. The site locations for additional two-panel benthic braided survey gill net sites (2-PBB) locations were chosen randomly within fixed depth zones. 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 roach and pike. 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.

1.2.2 Fish diet

Fish were frozen before being dissected for stomach content analysis in the IFI laboratory. Total stomach contents were inspected and individual items were counted and identified to the lowest taxonomic level possible. The percentage frequency occurrence (%O) of prey items were then calculated to identify key prey items (Amundsen *et al.*, 1996).

$$\%O_i = (N_i / N) \times 100$$

Where:

$\%O_i$ is the percentage frequency of prey item i,
N_i is the number of a particular species with prey i in their stomach,
N is total number of a particular species 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 in Glenade Lough in August 2016, with 347 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Perch was the most common fish species recorded, followed by roach. Eels and pike were also recorded. During the previous surveys in 2007, 2010 and 2013 the same species composition was recorded (Kelly and Connor, 2007 and Kelly *et al*., 2011 and 2014).

Table 1.1. Number of each fish species captured by each gear type during the survey on Glenade Lough, August 2016

Scientific name	Common name	Number of fish captured				
		BM CEN	FM CEN	2-PBB	Fyke	Total
Perca fluviatilis	Perch	163	5	0	5	173
Rutilus rutilus	Roach	143	22	0	1	166
Anguilla anguilla	European eel	0	0	0	5	5
Esox lucius	Pike	2	0	0	1	3

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 2016 survey are summarised in Table 1.2.

Perch was the dominant fish species in terms of abundance (CPUE) and roach was the dominant fish species in terms of biomass (BPUE) captured during the 2016 survey (Table 1.2).

The mean CPUE and BPUE (excluding the 88.9mm mesh panel of 2-PBB) for all species captured in the 2007, 2010, 2013 and 2016 surveys are illustrated in Figures 1.2 and 1.3.

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Glenade Lough, 2016

Scientific name	Common name	Mean CPUE (± S.E) **
Perca fluviatilis	Perch	0.271 (0.073)
Esox lucius	Pike	0.004 (0.002)
Rutilus rutilus	Roach	0.263 (0.103)
Anguilla anguilla	European eel	0.028 (0.011) *
		**Mean BPUE (± S.E) ** **
Perca fluviatilis	Perch	7.101 (2.223)
Esox lucius	Pike	3.245 (1.806)
Rutilus rutilus	Roach	10.448 (3.458)
Anguilla anguilla	European eel	7.361 (2.334) *

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

**CPUE and BPUE data above for all fish species except eels are not comparable to earlier surveys as an extra panel was added to the 2-PBB to provide additional information on large coarse fish.

Perch

Perch CPUE and BPUE fluctuated over the sampling period. The perch CPUE and BPUE was significantly higher in 2007 and 2013 than in 2010 and 2016 (Kruskal-Wallis $H=6.73$, $P<0.05$ and $H=8.62$, $P<0.05$) (Fig 1.2 and 1.3).

Roach

The roach CPUE and BPUE also fluctuated over the sampling period. Roach CPUE and BPUE was also significantly higher in 2013 than in 2016 (Kruskal-Wallis $H=6.19$, $P<0.05$ and $H=7.31$, $P<0.05$) (Fig 1.2 and 1.3).

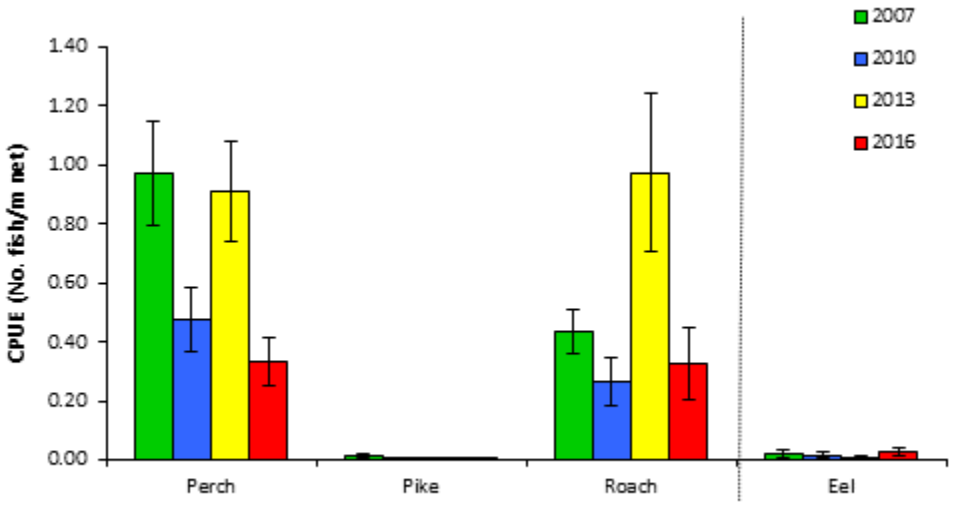

Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured in Glenade Lough (Eel CPUE based on fyke nets only), 2007, 2010, 2013 and 2016

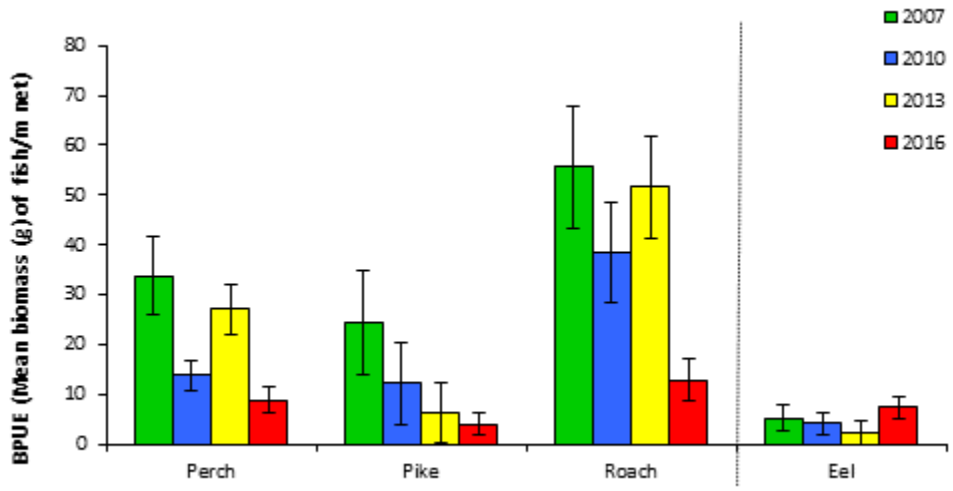

Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Glenade Lough (Eel BPUE based on fyke nets only), 2007, 2010, 2013 and 2016

1.3.3 Length frequency distributions and growth

Perch

Perch captured during the 2016 survey ranged in length from 3.5cm to 19.7cm (mean = 11.7cm) (Fig.1.4) with six age classes present, ranging from 0+ to 5+ with a mean L1 of 6.1cm (Table 1.3). The dominant age class was 2+ (Fig. 1.4). Perch captured during the 2010 and 2013 survey had a similar length and age range (Fig.1.4), with some larger and older fish recorded in the 2010 and 2013 surveys (Fig 1.4).

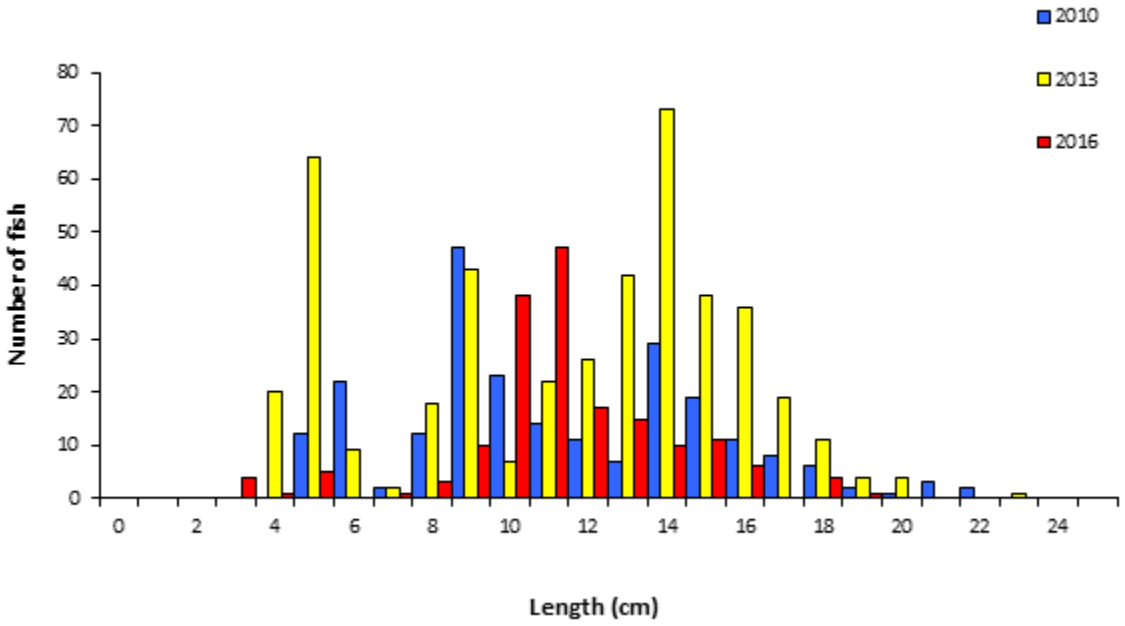

Fig. 1.4. Length frequency of perch captured on Glenade Lough, 2010, 2013 and 2016

Table 1.3. Mean (±S.E.) perch length (cm) at age for Glenade Lough, August 2016

	L_1	L_2	L_3	L_4	L_5
Mean (±S.E.)	6.1 (0.2)	9.6 (0.2)	12.4 (0.3)	14.1 (0.5)	14.2 (0.3)
N	36	34	28	18	4
Range	4.4-9.6	7.2-12.8	10.4-15.8	11.5-18.3	13.6-14.7

Roach

Roach captured during the 2016 survey ranged in length from 6.1cm to 25.0cm (mean = 12.2cm) (Fig.1.5) with seven age classes present, ranging from 1+ to 7+ with a mean L1 of 3.3cm (Table 1.4). The dominant age class was 3+ (Fig.1.5). Roach captured during the 2010 and 2013 surveys had a similar length and age range, with some smaller fish captured in 2013 and 2016 and some larger fish captured in 2010 and 2013 (Fig 1.5).

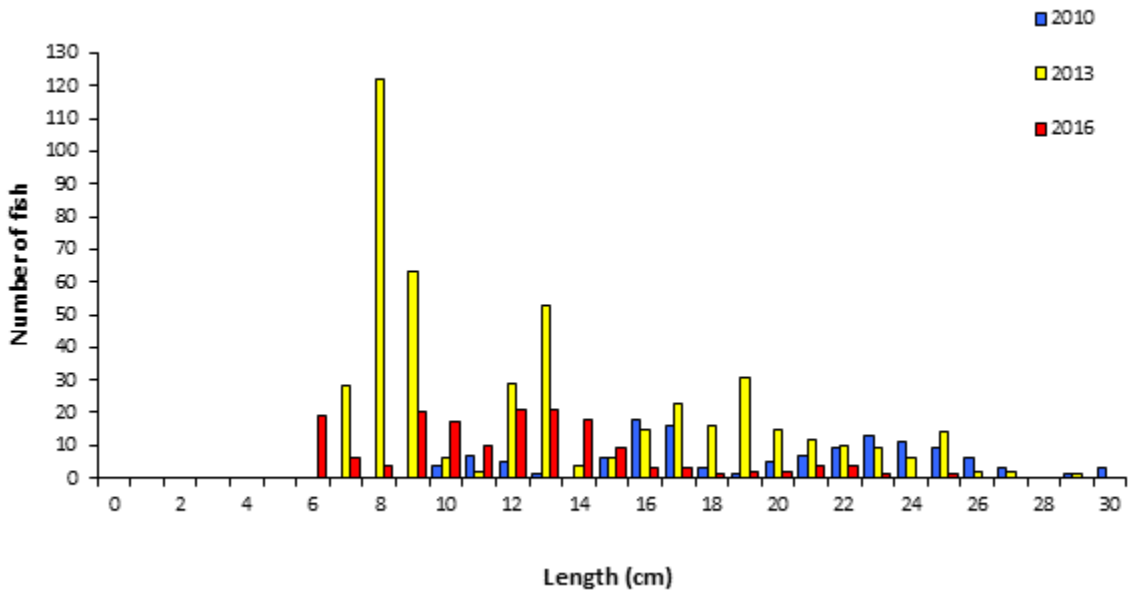

Fig. 1.5. Length frequency of roach captured on Glenade Lough, 2010, 2013 and 2016

Table 1.4. Mean (±S.E.) roach length (cm) at age for Glenade Lough, August 2016

	L_1	L_2	L_3	L_4	L_5	L_6	L_7
Mean (±S.E.)	3.3 (0.1)	7.6 (0.2)	11.6 (0.4)	14.8 (0.4)	18.0 (0.5)	20.7 (0.4)	21.8 (0.9)
N	44	39	32	25	14	6	3
Range	2.3-4.7	5.9-10.8	9.3-16.3	11.7-19.5	13.8-20.2	19.5-22.1	20.4-23.6

Other fish

Eels captured during the 2016 survey ranged in length from 37.6cm to 62.9cm and pike ranged in length from 44.7cm to 54.0cm.

1.3.4 Stomach and diet analysis

Dietary analysis 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. The stomach contents of a subsample of perch captured during the survey were examined and are presented below.

Perch

Perch initially start to feed on pelagic zooplankton. Once they reach an intermediate size they begin feeding on benthic resources eventually moving on to feed on fish once they are large enough (Hjelm *et al*., 2000). A total of 37 stomachs were examined. Of these 21 were found to contain no prey items. Of the remaining 16 stomachs containing food, 44% contained invertebrates, 31% unidentified digested material and 25% fish (Fig. 1.6).

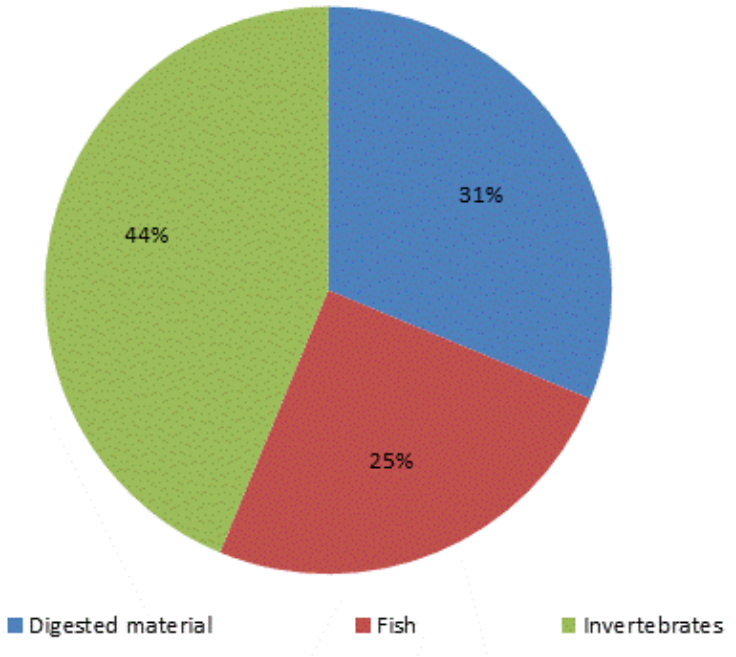

Fig. 1.6. Diet of perch (n=16) captured on Glenade Lough, 2016 (% occurrence)

1.4 Summary and ecological status

A total of four fish species were recorded in Glenade Lough in August 2016. Perch was the dominant fish species in terms of abundance (CPUE) and roach was the dominant fish species in terms of biomass (BPUE) captured during the 2016 survey.

The perch CPUE and BPUE was significantly higher in 2013 than in 2010 and 2016. Perch ranged in length from 3.5cm to 19.7cm with six age classes ranging from 0+ to 5+, indicating reproductive success in the previous six years. The dominant age class was 2+. Invertebrates (44%) were the dominant item in the stomachs of perch captured during the survey and fish were present in 25% of those containing food items (Fig. 1.6).

The roach CPUE and BPUE was significantly higher in 2013 than in 2016. Roach ranged in length from 6.1cm to 25.0cm with seven age classes ranging from 1+ to 7+, indicating reproductive success in seven of the previous eight years. The dominant age class was 3+.

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, Glenade Lough has been assigned an ecological status of Good for 2016 based on the fish populations present. In previous years the lake was assigned a fish status of Poor in 2013, Moderate in 2010 and Bad in 2007.

In the 2010 to 2015 surveillance monitoring reporting period, the EPA assigned Glenade Lough an overall ecological status of Poor.

1.5 References

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Inland Fisheries Ireland
3044 Lake Drive,
Citywest Business Campus,
Dublin 24,
Ireland.
D24 Y265

www.fisheriesireland.ie
info@fisheriesireland.ie

+353 1 8842 600