

National Research Survey Programme

Lakes 2016

Lough Lene

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Iascach Intíre Éireann
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National Research Survey Programme

**Fish Stock Survey of Lough Lene,
September 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

Lough Lene is a limestone lake, situated in the Upper Boyne catchment in Co. Westmeath (Plate 1.1, Fig. 1.1). It is located approximately 1km north of Collinstown and 4km north-east of Castlepollard. The lake has a surface area of 416.5ha, a mean depth >4m, a maximum depth of 20m and falls into typology class 8 (as designated by the EPA for the Water Framework Directive), i.e. deep (>4m), greater than 50ha and moderately alkaline (20-100mg/l CaCO₃).

Lough Lene is a clear, hard-water lake with areas of marl deposition. The lake supports a range of pondweed species (NPWS, 2006). A variety of stoneworts, indicators of marl or hard water lakes, are also present. Areas of woodland found along the shore include willows (*Salix* spp.), birch (*Betula* sp.) and alder (*Alnus glutinosa*) (NPWS, 2006). Bird species found along the shores of Lough Lene include mute swan, teal, pochard, great-crested grebe, little grebe, tufted duck, grey heron, water rail, mallard, golden eye, cormorant and wigeon (NPWS, 2006).

Lough Lene holds a small stock of large wild trout (O' Reilly, 2007), whilst perch, pike and tench are also known to be present. The average size of wild brown trout is 1.6kg and fish up to 5.5kg have been taken from the lake (O' Reilly, 2007). The lake is stocked by the Lough Lene Anglers Association with both brown and rainbow trout. From 2007 to 2010, between 5,000 and 10,000 brown trout were stocked annually. Over the same time period, between 7,000 and 26,000 rainbow trout were stocked into the lake annually.

Lough Lene was once home to a population of white-clawed crayfish (*Austropotamobius pallipes*), a species listed on Annex II of the E.U. Habitats Directive (NPWS, 2007). However, in 1986 this species was declared extinct from the lake due to an infestation of the fungal plague, *Aphanomyces astaci* (NPWS, 2000). Crayfish were reintroduced following their eradication; however, the plague reoccurred, leading to a second extinction (NPWS, 2007).

Lough Lene was previously surveyed in 2007, 2010 and 2013 as part of the WFD surveillance monitoring programme (Kelly and Connor, 2007 and Kelly *et al.*, 2011 and 2014). During the 2013 survey perch were found to be the dominant species present in the lake. Brown trout, rainbow trout, pike, tench and eels were also recorded in small numbers.



Plate 1.1. Lough Lene

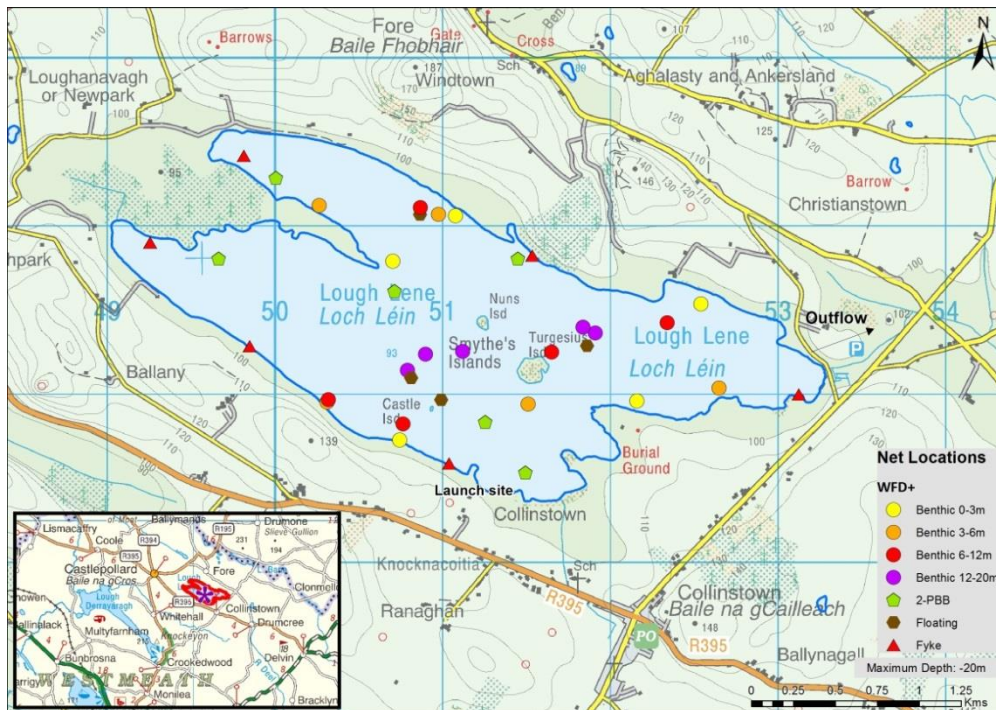


Fig. 1.1. Location map of Lough Lene showing net locations and depths of each net (outflow is indicated on map)



1.2 Methods

1.2.1 Netting methods

Lough Lene was surveyed over two nights from the 26th to the 28th of September 2016. A total of six sets of Dutch fyke nets, 20 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (5 @ 0-2.9m, 5 @ 3-5.9m, 5 @ 6-11.9m and 5 @ 12-19.9m) and four floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake (30 sites). The netting effort was supplemented using six 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. 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 apart from perch were measured and weighed on site and scales were removed from all brown trout, rainbow trout, roach, tench 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 eight fish species were recorded on Lough Lene in September 2016, with 1511 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. Tench, roach, brown trout, rainbow trout, three-spine stickleback, eels, tench and pike were also recorded but in smaller numbers. During the previous surveys in 2007, 2010 and 2013 the same species composition was recorded with the exception of three-spined stickleback which were not captured in the 2013 survey and eel which were not recorded in 2007. Wild brown trout were recorded in 2013 and 2016 and roach were first recorded in the 2016 survey (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 Lough Lene, September 2016

Scientific name	Common name	Number of fish captured				
		2-PBB	BM CEN	FM CEN	Fyke	Total
<i>Perca fluviatilis</i>	Perch	2	1461	0	0	1463
<i>Tinca tinca</i>	Tench	12	5	0	0	17
<i>Oncorhynchus mykiss</i>	Rainbow trout	3	4	3	0	10
<i>Salmo trutta</i>	Brown trout (wild)	0	1	0	0	1
	Brown trout (stocked)	0	3	4	0	7
<i>Rutilus rutilus</i>	Roach	0	4	1	0	5
<i>Esox lucius</i>	Pike	0	3	0	0	3
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0	1	0	2	3
<i>Anguilla anguilla</i>	European eel	0	0	0	2	2

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.

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



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

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

Scientific name	Common name	Mean CPUE (\pm S.E) **
<i>Perca fluviatilis</i>	Perch	1.355 (0.317)
<i>Tinca tinca</i>	Tench	0.011 (0.005)
<i>Salmo trutta</i>	Brown trout (stocked)	0.006 (0.003)
	Brown trout (wild)	0.001 (0.001)
<i>Oncorhynchus mykiss</i>	Rainbow trout (stocked)	0.008 (0.003)
<i>Rutilus rutilus</i>	Roach	0.004 (0.003)
<i>Esox lucius</i>	Pike	0.003 (0.002)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.002 (0.002)
<i>Anguilla Anguilla</i> *	European eel*	0.028 (0.011)*
		Mean BPUE (\pm S.E) **
<i>Perca fluviatilis</i>	Perch	41.458 (12.326)
<i>Tinca tinca</i>	Tench	19.602 (8.962)
<i>Salmo trutta</i>	Brown trout (stocked)	6.602 (3.429)
<i>Salmo trutta</i>	Brown trout (wild)	1.200 (1.200)
<i>Oncorhynchus mykiss</i>	Rainbow trout (stocked)	8.909 (3.563)
<i>Rutilus rutilus</i>	Roach	0.625 (0.487)
<i>Esox lucius</i>	Pike	1.631 (1.234)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.001 (0.001)
<i>Anguilla anguilla</i> *	European eel*	2.783 (2.783)*

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

Mean CPUE of perch increased and BPUE fluctuated over the four sampling occasions; however, it was only significantly higher in 2016 than in 2010 and 2013 (Kruskal-Wallis $H=8.97$, $P<0.05$) (Fig 1.2 and 1.3).

Brown trout

The mean brown trout CPUE and BPUE fluctuated over the four sampling occasions; however, these differences were not statistically significant (Fig 1.2 and 1.3).

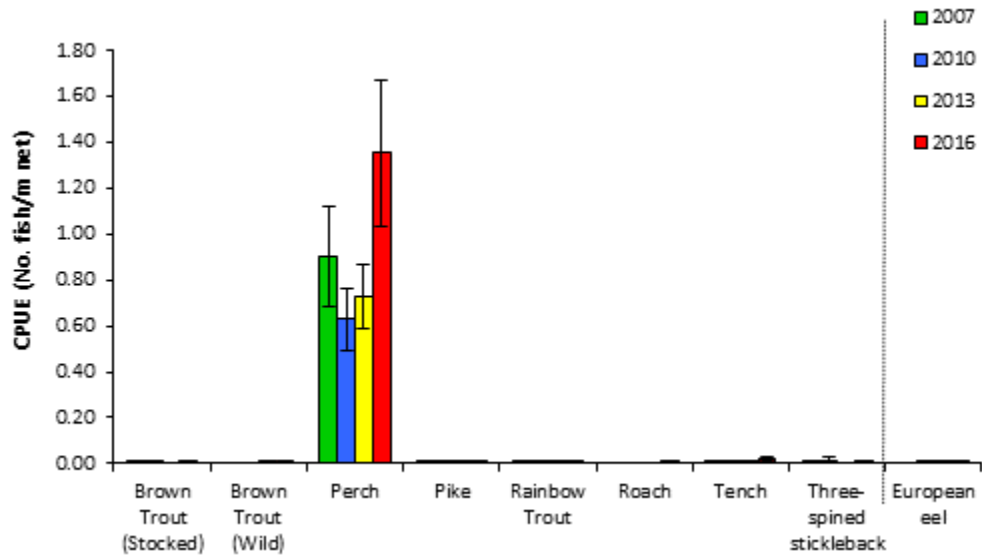


Fig. 1.2. Mean (\pm S.E.) CPUE for all fish species captured in Lough Lene (Eel CPUE based on fyke nets only), 2007, 2010, 2013 and 2016

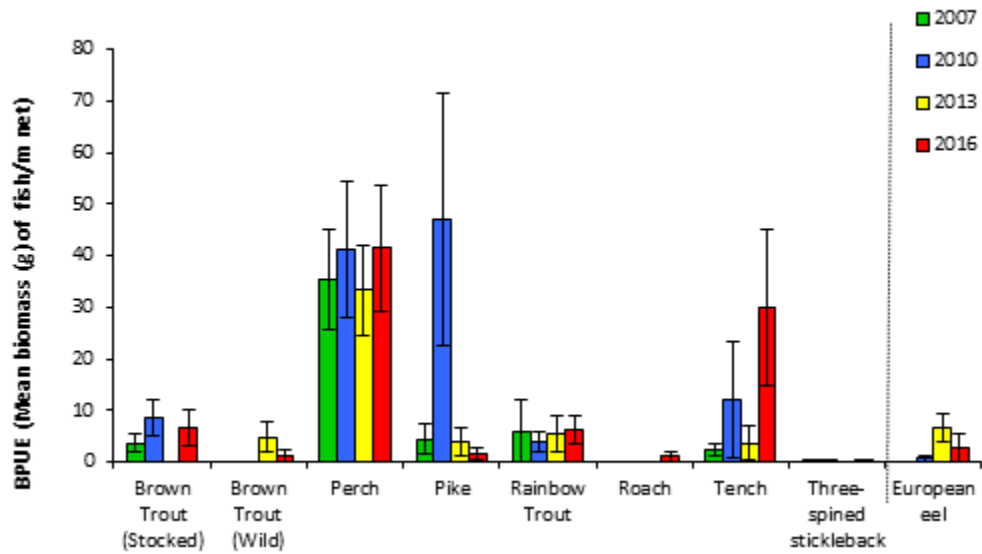


Fig. 1.3. Mean (\pm S.E.) BPUE for all fish species captured in Lough Lene (Eel BPUE based on fyke nets only), 2007, 2010, 2013 and 2016

1.3.3 Length frequency distributions and growth

Perch

Perch captured during the 2016 survey ranged in length from 3.8cm to 32.4cm (mean = 9.4cm) (Fig. 1.4). Seven age classes were present, ranging from 0+ to 6+, with a mean L1 of 6.8cm (Table 1.3). The dominant age class was 0+ (Fig. 1.4). Perch captured during the 2010 and 2013 surveys had a similar length and age range (Fig.1.4), apart from a large number of fish in the 6-8cm range (0+) present in the 2016 survey (Fig 1.4).

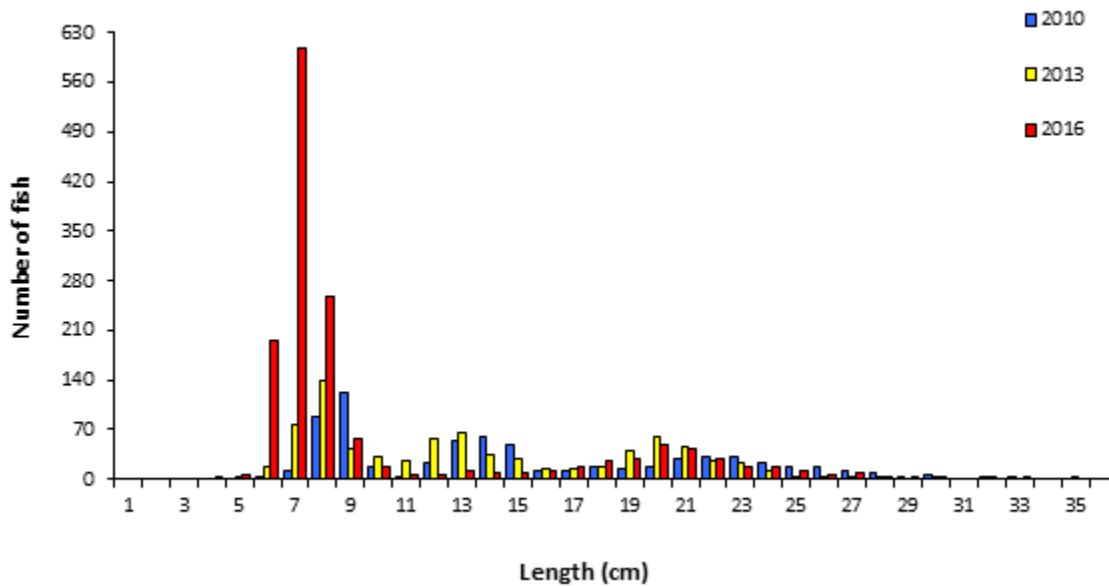


Fig. 1.4. Length frequency of perch captured on Lough Lene, 2010, 2013 and 2016

Table 1.3. Mean (\pm S.E.) perch length (cm) at age for Lough Lene, September 2016

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆
Mean (\pm S.E.)	6.8 (0.2)	12.4 (0.3)	16.3 (0.4)	20.4 (0.5)	21.7 (0.7)	23.4 (0.8)
N	61	44	33	18	10	8
Range	4.3-10.6	7.7-16.1	10.2-20.2	16.2-24.0	18.2-25.3	19.4-27.5



Brown trout

Only five stocked brown trout (2+ to 3+) and one wild brown trout (5+) were captured during the 2016 survey ranging in length from 40.3cm to 49.4cm (mean = 45.2cm). Brown trout captured during the 2010 and 2013 surveys had similar length and age ranges, with some larger fish recorded in the previous surveys. Wild brown trout were recorded in 2013 and 2016 but not the 2010 survey.

Other fish

Eels captured during the 2016 survey ranged in length from 51.3cm to 72.5cm and rainbow trout ranged in length from 35.2cm to 52.5cm, all aged 2+. Three-spined stickleback ranged in length from 2.1cm to 4.2cm. Tench ranged in length from 39.8cm to 54.7cm and pike ranged from 35.3cm to 71.1cm. Roach were first recorded in the 2016 survey and ranged in length from 10.0cm to 35.7cm.

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 start feeding on benthic resources eventually moving on to feed on fish once they are large enough (Hjelm *et al.*, 2000). A total of 103 stomachs were examined. Of these 50 were found to contain no prey items. Of the remaining 53 stomachs containing food, 37% contained unidentified digested material, 21% zooplankton, 19% invertebrates, 17% fish, 4% digested material /zooplankton and 2% fish/zooplankton (Fig. 1.5).

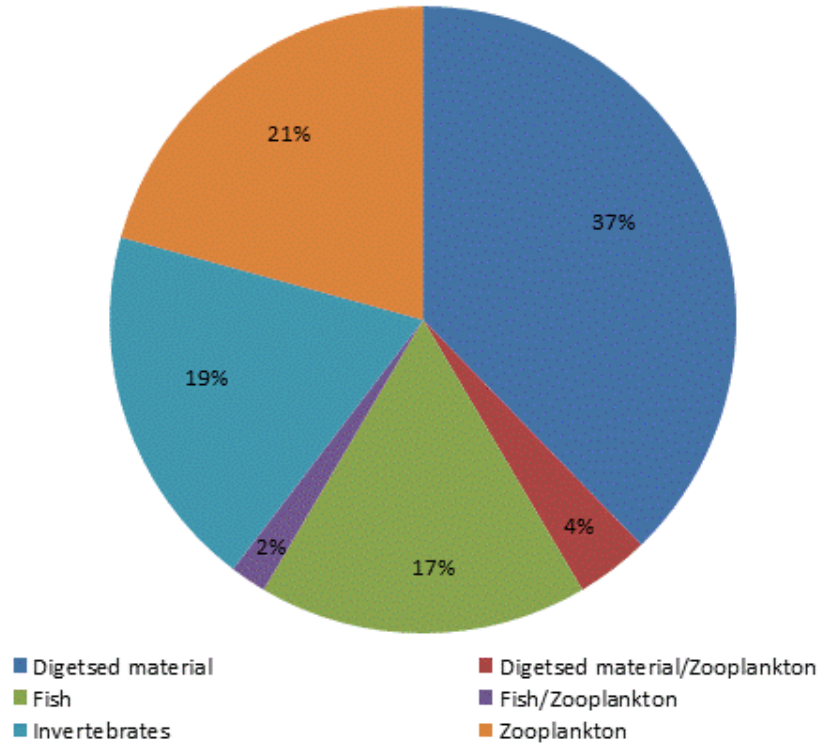


Fig 1.5. Diet of perch (n=53) captured on Lough Lene, 2016 (% occurrence)



1.4 Summary and ecological status

A total of eight fish species were recorded on Lough Lene in September 2016. Perch was the dominant fish species in terms of both abundance (CPUE) and biomass (BPUE), captured during the 2016 survey.

Mean perch CPUE increased and BPUE fluctuated over the four sampling occasions; however, the perch CPUE was only significantly higher in 2016 than in 2010 and 2013. Perch ranged in length from 3.8cm to 32.4cm and ranged in age from 0+ to 6+, indicating reproductive success in each of the previous seven years. The dominant age class was 0+.

Roach were recorded in Lough Lene for the first time in 2016, the source of the colonisation is unknown but likely to have been from the use of live bait on the lake. The colonisation of the lake by this non-native species has the potential to negatively impact the native brown trout populations and other species present. On-going monitoring will be needed to assess these impacts fully.

The mean brown trout CPUE and BPUE fluctuated over the four sampling occasions; however, these differences were not statistically significant. Only five stocked brown trout (2+ to 3+) and one wild brown trout (5+) were captured during the 2016 survey ranged in length from 40.3cm to 49.4cm (mean = 45.2cm). Brown trout captured during the 2010 and 2013 surveys had similar length and age ranges, with some larger fish recorded in the previous surveys.

Wild brown trout were recorded in 2013 and 2016 but not the 2010 survey. Stocked brown trout were recorded in 2010 and 2016 but not the 2013 survey. A small number of stocked rainbow trout were also recorded in the present survey (aged at 2+).

Lough Lene is stocked annually with brown trout and rainbow trout (a non-native species). These hatchery reared fish have been released into the lake to create an angling amenity in the area, as the native brown trout stock have declined in recent years and cannot support large fishing pressures. A summary of the effects of stocking on the lake and recommendations for the future can be found in the previous report (Kelly *et al.*, 2011b).

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 Lene has been assigned an ecological status of Moderate for 2016 based on the fish populations present. The lake was previously assigned a fish status of Bad in 2010 and Good in 2007 and 2013.

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



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