



Sampling Fish for the Water Framework Directive

Lakes 2013

Lough Shindilla



Iascach Intíre Éireann
Inland Fisheries Ireland

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

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1.1 Introduction

Lough Shindilla is the uppermost lake on the Screebe system in Co. Galway, located approximately 0.75km west of Maam Cross (Plate 1.1, Fig. 1.1). The lake has a surface area of 65.3ha, a mean depth >4m, a maximum depth of 22m and has been characterised as typology class 4 (as designated by the EPA for the Water Framework Directive), i.e. deep (>4m), greater than 50ha and low alkalinity (<20mg/l CaCO₃).

Lough Shindilla is located in the Maumturk Mountains Special Area of Conservation (SAC). Most of the mountains in the SAC exceed 600m in height and the majority of the land within the site lies above an altitude of 250m. The main bedrock in the south is made up of quartzite and in the north of the SAC the bedrock is generally comprised of shales and slates (NPWS, 2006).

The site is a SAC for containing blanket bog, lowland oligotrophic lakes, alpine heath, siliceous rocky and Rhynchosporion, all habitats listed on Annex I of the E.U. Habitats Directive (NPWS, 2006). The SAC is also selected for containing slender naiad and Atlantic salmon, both species listed on Annex II of the same Directive. Species listed in the Red Data Book which are located in the SAC include the Irish hare and the common frog. Peregrine, a species listed on Annex I of the EU Birds Directive also occur within the SAC (NPWS, 2006).

Damaging activities and threats to the Maumturk Mountains SAC include overgrazing, peat-cutting and afforestation. Grazing, in particular by sheep, is quite severe within the site and has resulted in the erosion of both lowland and mountain blanket bog (NPWS, 2006).

The lake holds a stock of brown trout and gets the occasional run of sea trout and salmon (O'Reilly, 2007). Lough Shindilla was previously surveyed in 2007 and 2010 as part of the WFD surveillance monitoring programme (Kelly and Connor, 2007 and Kelly *et al.*, 2011). During the 2010 survey Arctic char were found to be the dominant species present in the lake. Brown trout, perch, three-spined stickleback and eels were also captured.



Plate 1.1. Lough Shindilla

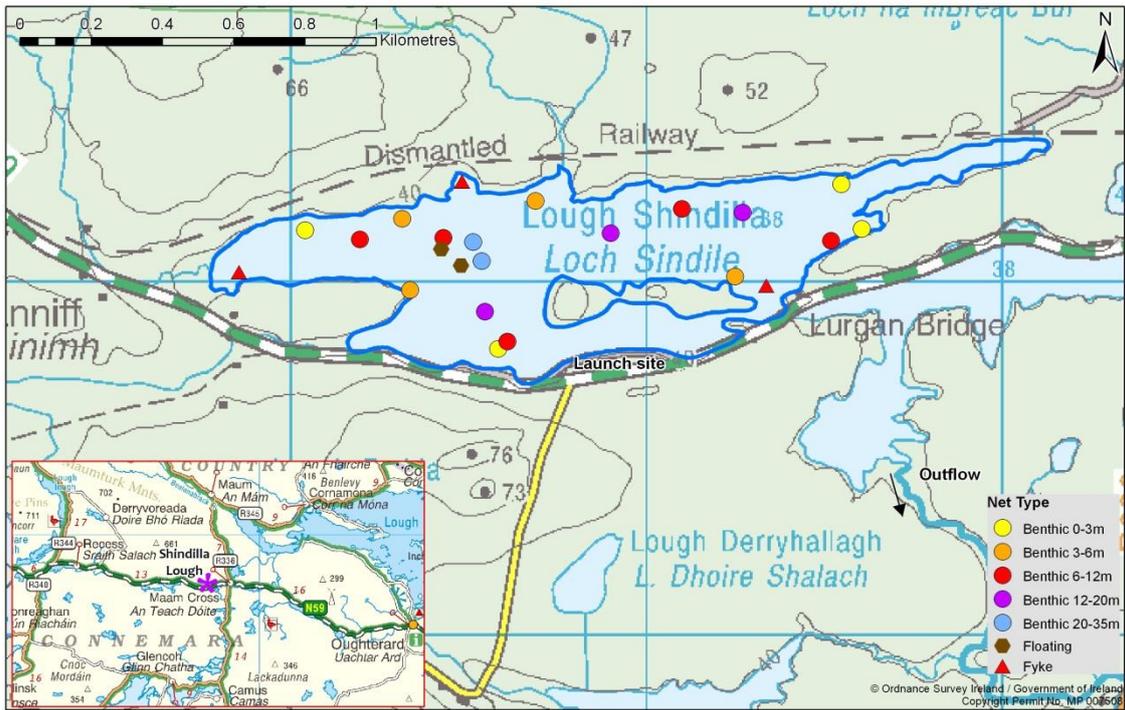


Fig. 1.1. Location map of Lough Shindilla showing net locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lough Shindilla was surveyed over one night from the 6th to the 7th of August 2013. A total of three sets of Dutch fyke nets, 18 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (4 @ 0-2.9m, 4 @ 3-5.9m, 5 @ 6-11.9m, 3 @ 12-19.9m and 2 @ 20-34.9m) and two floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake (23 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 apart from perch were measured and weighed on site and scales were removed from all Arctic char, salmon and 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 retained for further analysis.

1.3 Results

1.3.1 Species Richness

A total of five fish species were recorded in Lough Shindilla in August 2013, with 121 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Brown trout were the most abundant fish species recorded, followed by perch, Arctic char and eels. During the previous surveys in 2010 and 2007 the same species composition was recorded with the exception of salmon which were not recorded in 2010, three-spined stickleback which were only captured in 2010, minnow which were only present in 2007 and perch were not recorded in 2007.

Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Shindilla, 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	41	9	0	50
<i>Perca fluviatilis</i>	Perch	48	0	0	48
<i>Salvelinus alpinus</i>	Arctic char	15	0	0	15
<i>Anguilla anguilla</i>	European eel	0	0	7	7
<i>Salmo salar</i>	Salmon	1	0	0	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.

Brown trout was the dominant species in terms of abundance (CPUE) and perch was the dominant species in terms of biomass (BPUE).

The mean brown trout CPUE and BPUE was significantly higher in 2013 than in 2010 (Mann-Whitney, $P < 0.05$) (Table 1.2; Figs 1.2 and 1.3). There were no significant differences between 2007 and the other sampling years.

Although the mean Arctic char CPUE and BPUE was substantially lower in 2013 than in 2010 and 2007, these differences were not statistically significant (Table 1.2; Fig 1.2 and 1.3).

No perch were recorded in the 2007 survey. Although the mean perch CPUE and BPUE was higher in 2013 than in 2010, these differences were not statistically significant (Table 1.2; Fig 1.2 and 1.3).

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

Scientific name	Common name	2007	2010	2013
Mean CPUE				
<i>Salmo trutta</i>	Brown trout	0.046 (0.012)	0.033 (0.015)	0.072 (0.018)
<i>Perca fluviatilis</i>	Perch	-	0.032 (0.013)	0.070 (0.021)
<i>Salvelinus alpinus</i>	Arctic char	0.091 (0.028)	0.077 (0.305)	0.022 (0.008)
<i>Salmo salar</i>	Salmon	0.001 (0.001)	-	0.001 (0.001)
<i>Phoxinus phoxinus</i>	Minnow	0.010 (0.006)	-	-
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	-	0.001 (0.001)	-
<i>Anguilla anguilla</i>	European eel*	0.067 (0.059)	0.122 (0.475)	0.039 (0.011)
Mean BPUE				
<i>Salmo trutta</i>	Brown trout	3.812 (1.035)	1.539 (0.697)	5.467 (1.486)
<i>Perca fluviatilis</i>	Perch	-	6.907 (3.434)	9.950 (3.431)
<i>Salvelinus alpinus</i>	Arctic char	7.717 (2.482)	5.104 (2.131)	3.301 (1.298)
<i>Salmo salar</i>	Salmon	5.797 (5.597)	-	0.043 (0.043)
<i>Phoxinus phoxinus</i>	Minnow	0.043 (0.030)	-	-
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	-	0.0004 (0.0004)	-
<i>Anguilla anguilla</i>	European eel*	9.028 (8.746)	16.183 (5.836)	4.194 (0.682)

* 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

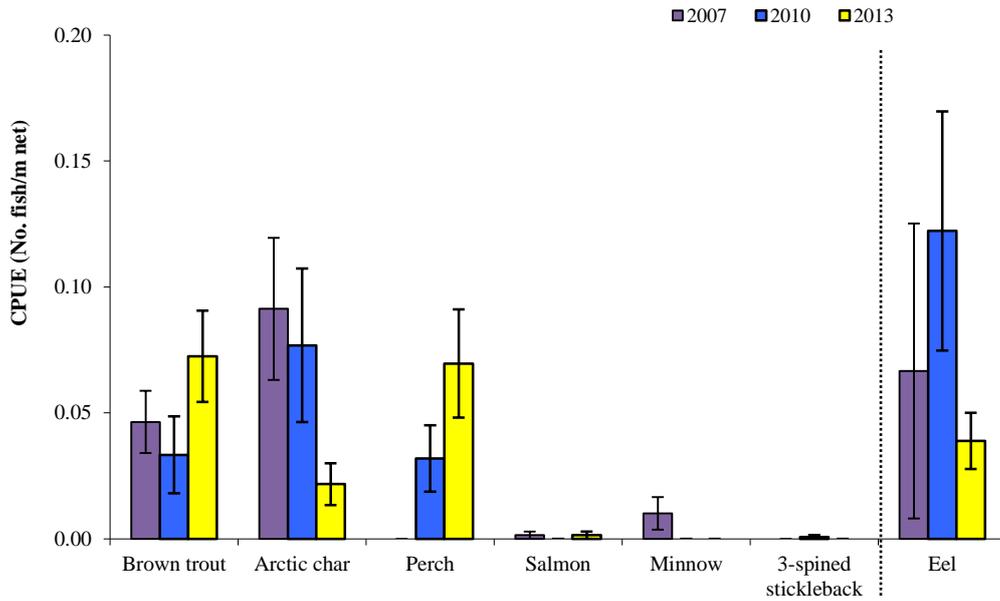


Fig. 1.2. Mean (\pm S.E.) CPUE for all fish species captured in Lough Shindilla (Eel CPUE based on fyke nets only), 2007, 2010 and 2013

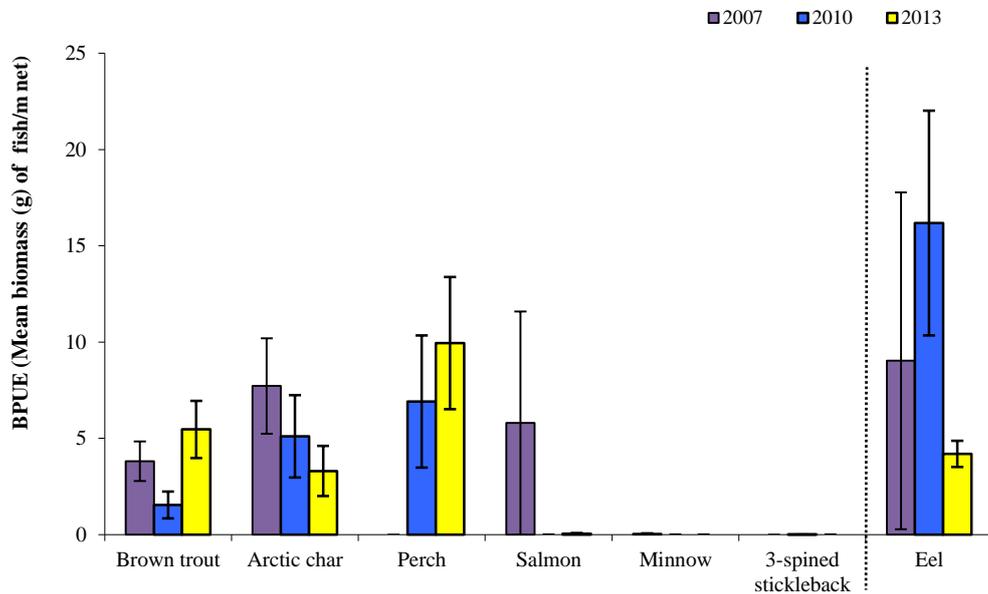


Fig. 1.3. Mean (\pm S.E.) BPUE for all fish species captured in Lough Shindilla (Eel BPUE based on fyke nets only), 2007, 2010 and 2013

1.3.3 Length frequency distributions and growth

Brown trout captured during the 2013 survey ranged in length from 11.5cm to 26.5cm (mean = 17.9cm) (Fig. 1.4) with four age classes present, ranging from 1+ to 4+, with a mean L1 of 6.9cm (Table 1.3). The dominant age class was 1+ (Fig 1.4). Mean brown trout L4 was 23.5cm (Table 1.3) indicating a very 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 survey had a similar length range, age range and dominant age class (Fig. 1.4). In the 2007 survey, brown trout ranged in length from 12.6cm to 32.3cm (aged 1+ to 3+) and the dominant age class was 2+ (Fig.1.4).

Perch captured during the 2013 survey ranged in length from 12.6cm to 30.5cm (mean = 20.4cm) (Fig. 1.5) with five age classes present, ranging from 1+ to 7+, with a mean L1 of 7.2cm (Table 1.4). The dominant age class was 4+ (Fig 1.5). Perch captured during the 2010 survey had a similar length range, age range and dominant age class (Fig. 1.5). No perch were recorded in the 2007 survey.

Arctic char captured during the 2013 survey ranged in length from 22.5cm to 25.2cm (Fig 1.6) with three age classes present, ranging from 3+ to 5+. Arctic char captured during the 2010 survey ranged in length from 12.5cm to 20.9cm and had a younger age range of 1+ to 5+. In the 2007 survey, Arctic char ranged in length from 7.0cm to 23.0cm and had an age range of 2+ to 5+. The dominant age class was similar in 2010 and 2007, however, only older fish were captured in 2013 (Fig. 1.6).

One salmon was captured in 2013 measuring 13.0cm (aged at 1+) and eels ranged from 32.6cm to 50.8cm.

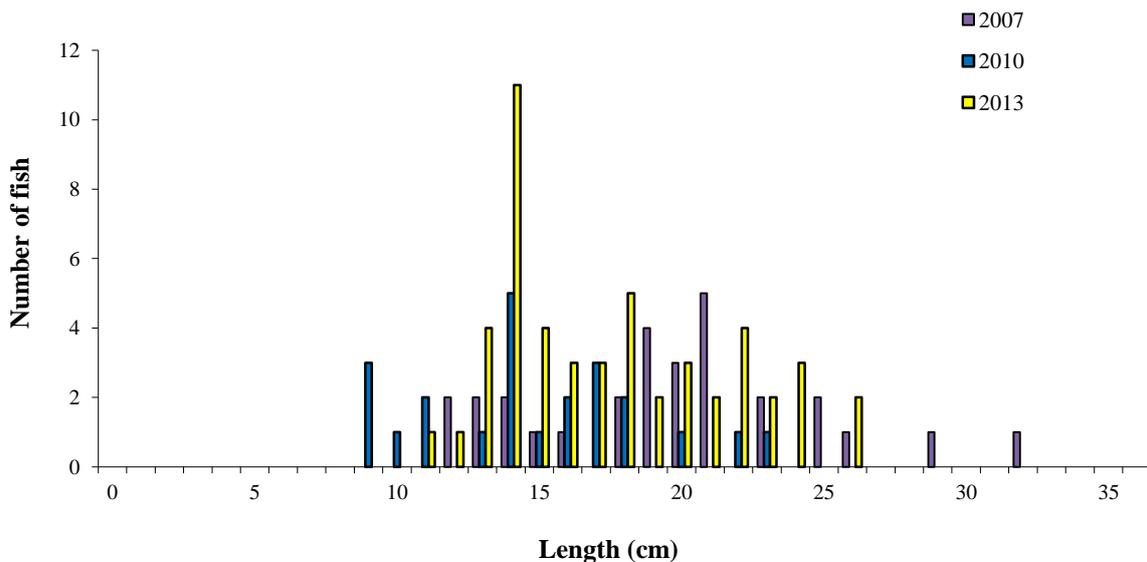


Fig. 1.4. Length frequency of brown trout captured on Lough Shindilla, 2007, 2010 and 2013

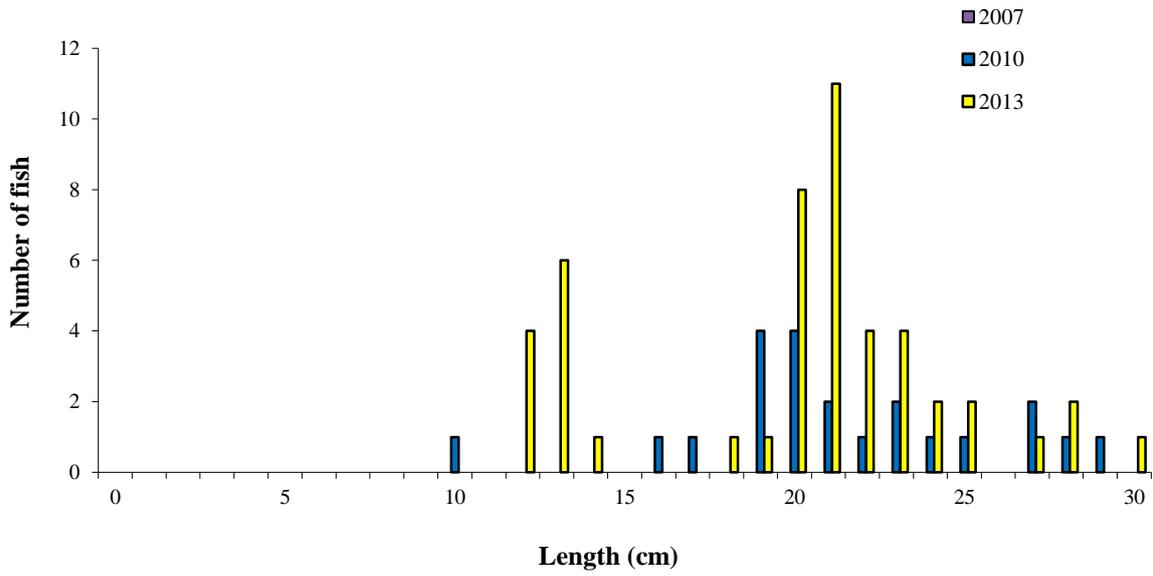


Fig. 1.5. Length frequency of perch captured on Lough Shindilla, 2007, 2010 and 2013

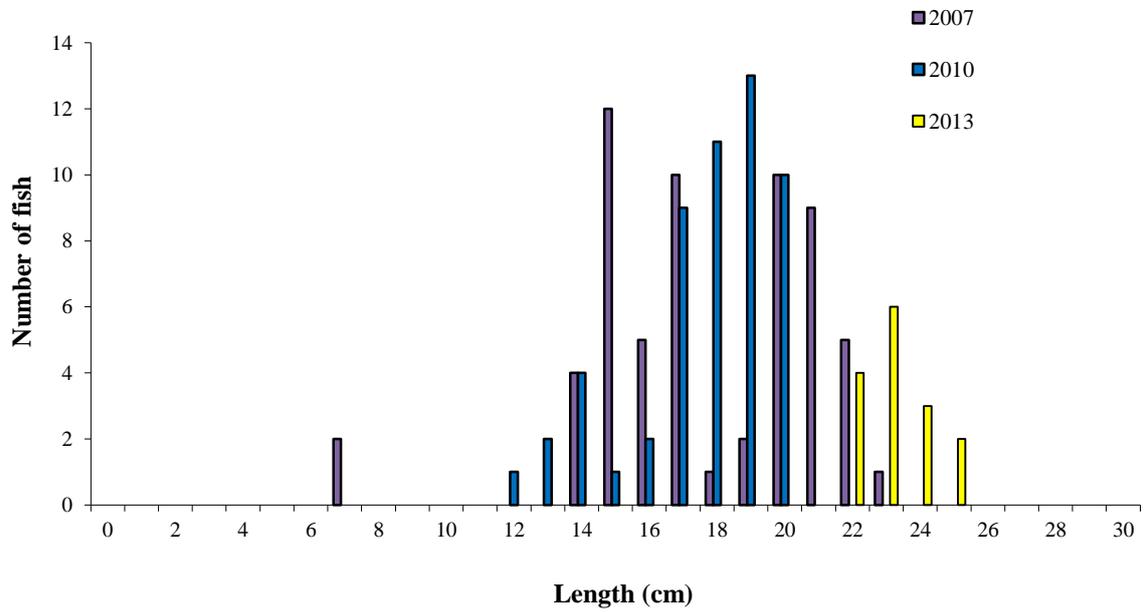


Fig. 1.6. Length frequency of Arctic char captured on Lough Shindilla, 2007, 2010 and 2013

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

	L ₁	L ₂	L ₃	L ₄
Mean	6.9	14.6	20.2	23.5
N	49	28	13	1
Range	4.3-10.0	9.4-19.0	14.7-23.7	23.5-23.5

Table 1.4. Mean (\pm SE) perch length (cm) at age for Lough Shindilla, August 2013

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇
Mean	7.2	15.2	19.7	22.5	22.5	25.9	26.5
N	36	28	28	21	8	1	1
Range	6.1-9.4	13.5-19.6	16.3-23.7	19.1-28.7	21.0-25.1	25.9-25.9	26.5-26.5

1.4 Summary

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

The mean brown trout CPUE and BPUE was significantly higher in 2013 than in 2010. There were no significant differences between 2007 and the other sampling years. Brown trout ranged in age from 1+ to 4+, indicating reproductive success in four of the previous five years. The dominant age class was 1+. Length at age analyses revealed that brown trout in the lake exhibit a very slow rate of growth according to the classification scheme of Kennedy and Fitzmaurice.

Although the mean Arctic char CPUE and BPUE was substantially lower in 2013 than in 2010 and 2007, these differences were not statistically significant. Arctic char ranged in age from 3+ to 5+, indicating reproductive success in three of the previous six years. However, no 0+, 1+ or 2+ fish were recorded.

Perch were recorded in Lough Shindilla for the first time in 2010, likely colonising the lake from Ardderry Lough during the floods in 2008 and 2009. Although the mean perch CPUE and BPUE was higher in 2013 than in 2010, these differences were not statistically significant. In 2013 perch ranged in age from 1+ to 7+, indicating reproductive success in seven of the previous eight years. The dominant age class was 4+. The colonisation of the lake by this non-native species has the potential to negatively impact the native brown trout and Arctic char populations. On-going monitoring will be needed to assess these impacts fully.

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, Lough Shindilla 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 Lough Shindilla an overall draft ecological status of Good, based on all monitored physico-chemical and biological elements, including fish.

1.5 References

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A dark blue geometric shape, resembling a stylized wave or a folded piece of paper, occupies the lower half of the page. It has a white dashed line pattern that flows across its width. The shape is set against a white background.

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