Sampling Fish for the Water Framework Directive

Lakes 2010

Lough Macnean Lower

Iascach Intíre Éireann
Inland Fisheries Ireland

ACKNOWLEDGEMENTS

1.1 Introduction

Lough Macnean Lower (Plate 1.1, Fig. 1.1) is a large freshwater lake located in County Fermanagh, at an altitude of 51m a.s.l. It is a mesotrophic lake, with a surface area of 456ha, mean depth of 1.5m and maximum depth of 12.7m. The lake is categorised as typology class 6 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. shallow (<4m), greater than 50ha and moderately alkaline (20-100mg/l CaCO3).

Lough Macnean Lower is fed by the Belcoo River which flows from Lough Macnean Upper into the lake near the village of Belcoo. The lake then empties into the Arney River. Lough Macnean Lower contains two islands, Cushrush Island which is the larger of the two and Inishee or Jinny's Island, which is smaller and is completely forested. A causeway was built onto Cushrush Island in the 1960's to allow animals to be moved on to the island. The shores of both the lower and upper loughs have good examples of wet woodland and of extensive fen and reed bed communities (NIEA, 2009b). The islands in both loughs are important breeding sites for lapwing, snipe and curlew (NIEA, 2009b).

Both Lough Macnean Upper and Lough Macnean Lower were formed by a process of glaciation. Glaciers excavated deep basins in the carboniferous rocks, creating steep valley sides and rocky cliffs (NIEA, 2009a). The lower lough is enclosed by a steep limestone escarpment. Agricultural usage along the shorelines of Lough MacNean Lower is more developed when compared to the upper lough. The underlying limestone soils produce good quality grassland and the southern shores and lower slopes are farmed intensively (NIEA, 2009a).

The shape of Lough Macnean Lower was changed dramatically during the 1960's when a major dredging operation took place. The level of the lake was dropped by approximately 1m resulting in wide areas of shallows as well as exposure of a lot of soft and barren shoreline (IFT, unpublished data).

In a survey carried out in 1969, perch, pike, rudd, roach, bream, rudd x bream and roach x bream hybrids were all recorded in Lough Macnean Lower (IFT, unpublished data). The lake was again surveyed in 2006 as part of the NSSHARE Fish in Lakes Project (Kelly *et al.*, 2007). During this survey roach were found to be the dominant species present in the lake, followed by perch. Pike, bream and roach x bream hybrids were also recorded.

Plate 1.1. Lough Macnean Lower

Lough Macnean Lower, Cavan / Fermanagh
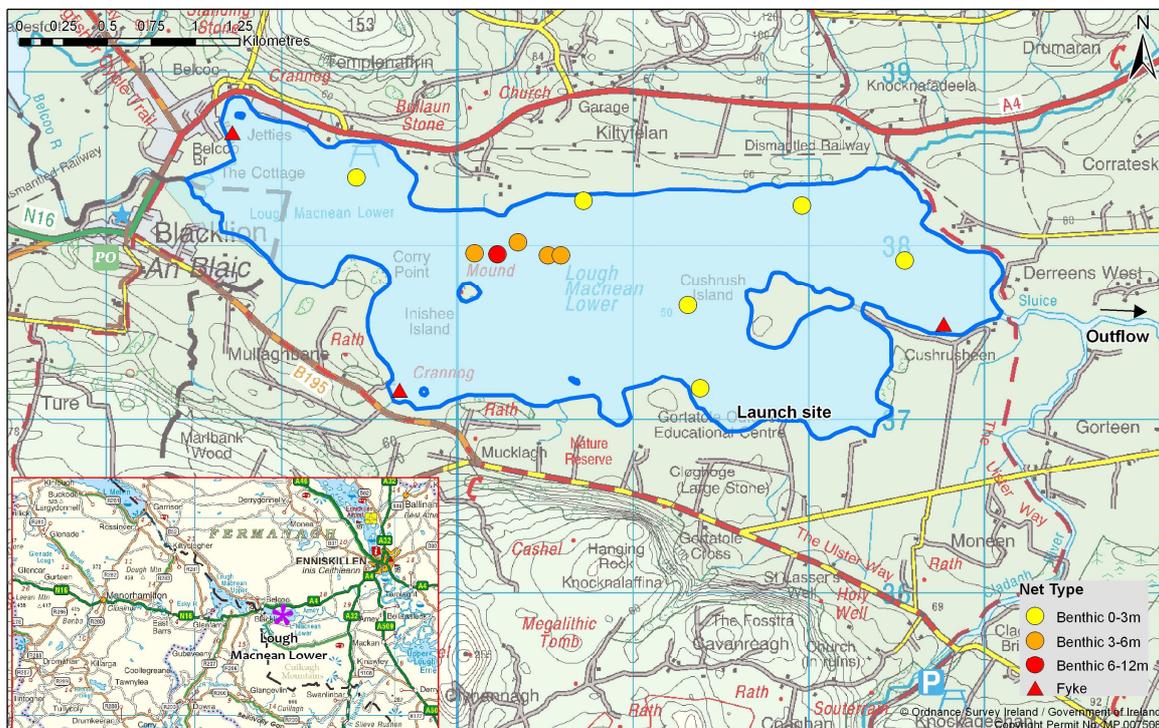
Fig. 1.1. Location map of Lough Macnean Lower showing net locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lough Macnean Lower was surveyed over one night on the 5th of July 2010. A total of three sets of Dutch fyke nets and eleven benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (6 @ 0-2.9m, 4 @ 3-5.9m and 1 @ 6-11.9m) were deployed in the lake (14 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 roach, rudd, bream and roach x bream hybrids. 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 and one type of hybrid were recorded in Lough Macnean Lower in July 2010, with 400 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Roach was the most abundant fish species recorded, followed by perch and roach x bream hybrids.

Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Macnean Lower, July 2010

| Scientific name	Common name	Number of fish captured		
		Benthic mono multimesh gill nets	Fyke nets	Total
Rutilus rutilus	Roach	205	0	205
Perca fluviatilis	Perch	90	0	90
Rutilus rutilus x Abramis brama	Roach x Bream hybrid	82	0	82
Anguilla anguilla	European eel	0	17	17
Abramis brama	Bream	4	0	4
Scardinius erythropthalmus	Rudd	2	0	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 are summarised in Table 1.2. Mean CPUE is illustrated in Figure 1.2. Although the mean perch and roach CPUE are lower in 2010 than in 2006 and the mean roach x bream hybrid and eel CPUE are higher in 2010 than in 2006, these differences were not statistically significant.

The differences in the mean roach CPUE between Lough Macnean Lower and four other similar lakes were assessed with no significant differences being found (Fig. 1.3). The differences in the mean perch CPUE between Lough Macnean Lower and three other similar lakes were assessed with no significant differences being found (Fig. 1.4).

Table 1.2. Mean (S.E.) CPUE and BPUE on Lough Macnean Lower

| Scientific name	Common name	2006	2010
		Mean CPUE	
Rutilus rutilus	Roach	0.710 (0.258)	0.488 (0.164)
Perca fluviatilis	Perch	0.544 (0.152)	0.214 (0.068)
Rutilus rutilus x Abramis brama	Roach x Bream hybrid	0.055 (0.016)	0.195 (0.063)
Abramis brama	Bream	0.033 (0.013)	0.009 (0.004)
Scardinius erythropthalmus	Rudd	-	0.004 (0.005)
Esox lucius	Pike	0.008 (0.004)	-
Gobio gobio	Gudgeon	0.005 (0.003)	-
Anguilla anguilla	European eel	0.028 (0.011)	0.094 (0.029)
		Mean BPUE	
Rutilus rutilus	Roach	19.997 (6.945)	21.248 (7.175)
Rutilus rutilus x Abramis brama	Roach x Bream hybrid	35.707 (11.599)	17.238 (4.913)
Perca fluviatilis	Perch	27.589 (6.569)	10.775 (3.180)
Abramis brama	Bream	21.716 (8.801)	7.145 (3.163)
Scardinius erythropthalmus	Rudd	-	0.602 (0.602)
Esox lucius	Pike	6.706 (3.409)	-
Gobio gobio	Gudgeon	0.004 (0.004)	-
Anguilla anguilla	European eel	11.627 (11.627)	35.278 (14.590)

* On the rare occasion where biomass data was unavailable for an individual fish, this was determined from a length/weight regression for that species.
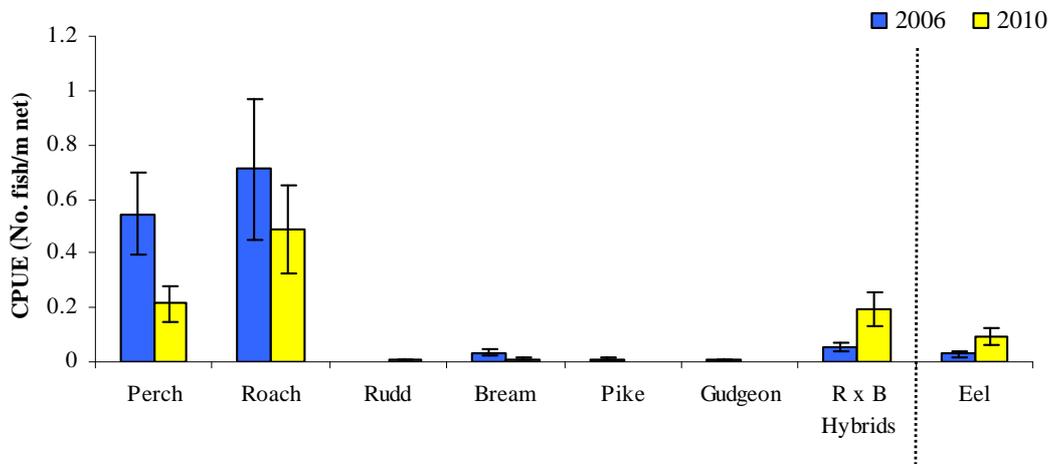
Fig. 1.2. Mean (±S.E.) CPUE on Lough Macnean Lower (Eel CPUE based on fyke nets only)
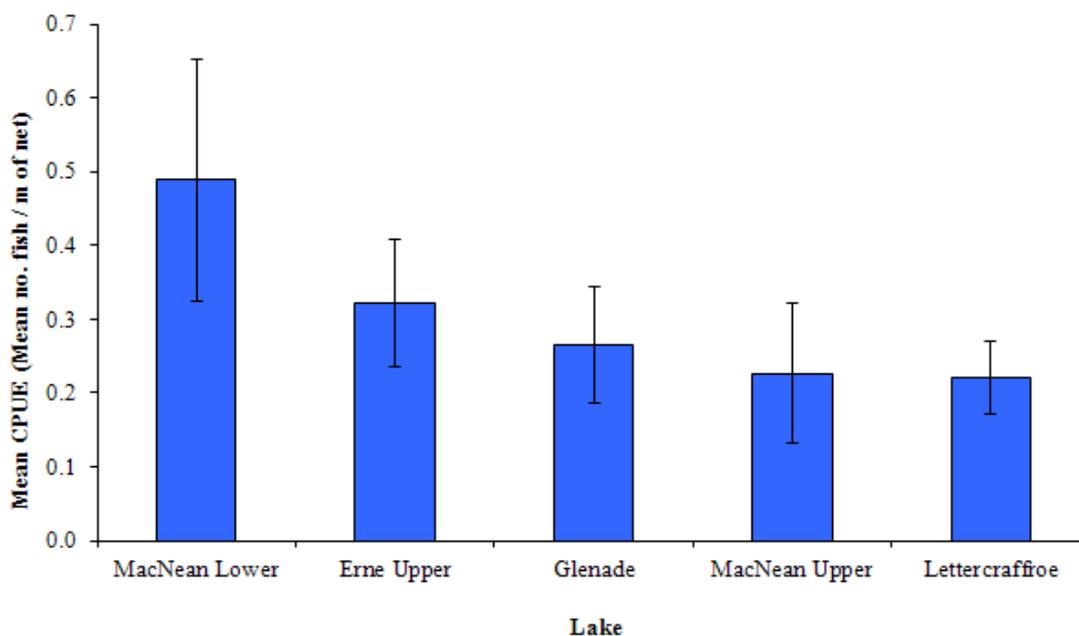
Fig. 1.3. Mean (±S.E.) roach CPUE in five lakes surveyed during 2010
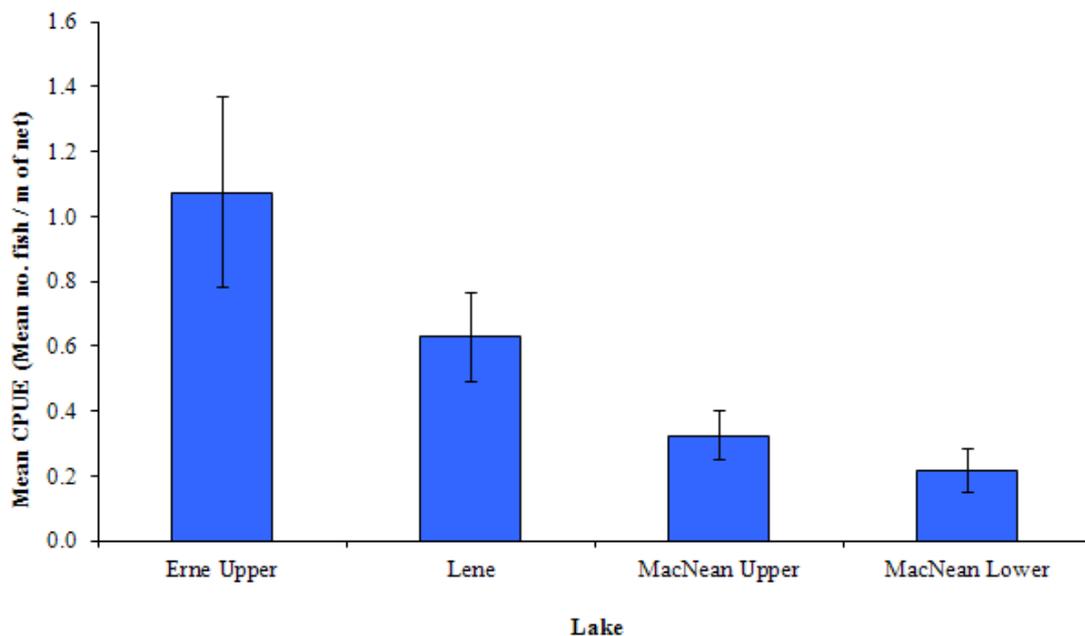
**Fig. 1.4. Mean (±S.E.) perch CPUE in four lakes surveyed during 2010**

*1.3.3 Length frequency distributions*

Roach captured during the 2010 survey ranged in length from 4.0cm to 24.5cm (mean = 13.3cm) (Fig. 1.5). Roach captured during the 2006 survey ranged in length from 5.5cm to 23.3cm (Fig. 1.5).

Perch captured during the 2010 survey ranged in length from 3.0cm to 26.0cm (mean = 13.0cm) (Fig.1.6). Perch captured during the 2006 survey ranged in length from 7.2cm to 26.5cm (Fig.1.6).

Bream captured during the 2010 survey ranged in length from 33.0cm to 37.3cm. Eels ranged in length from 39.0cm to 73.1cm. Roach x bream hybrids ranged in length from 8.5cm to 35.9cm and rudd ranged in length from 17.6cm to 19.9cm.
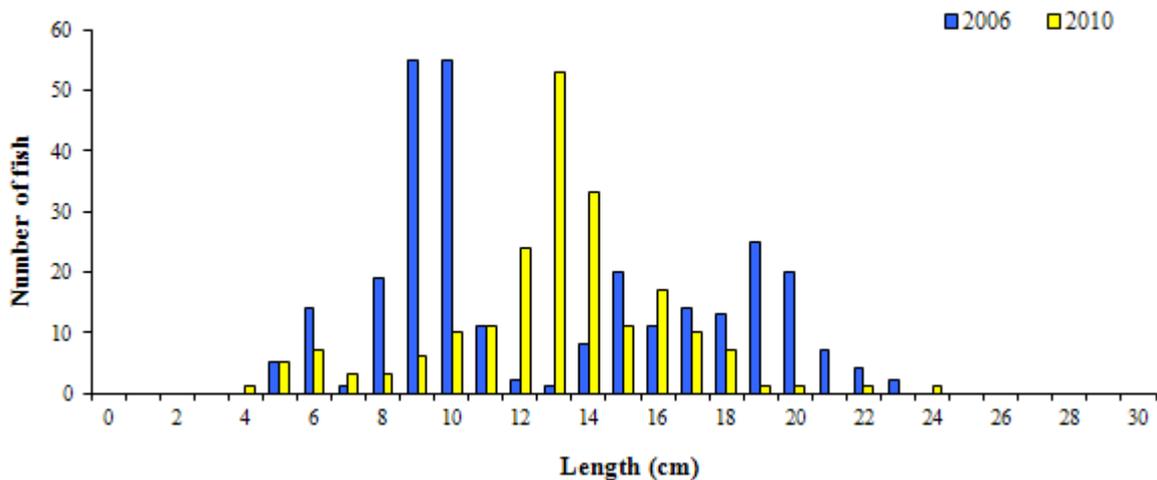
Fig. 1.5. Length frequency of roach captured on Lough Macnean Lower
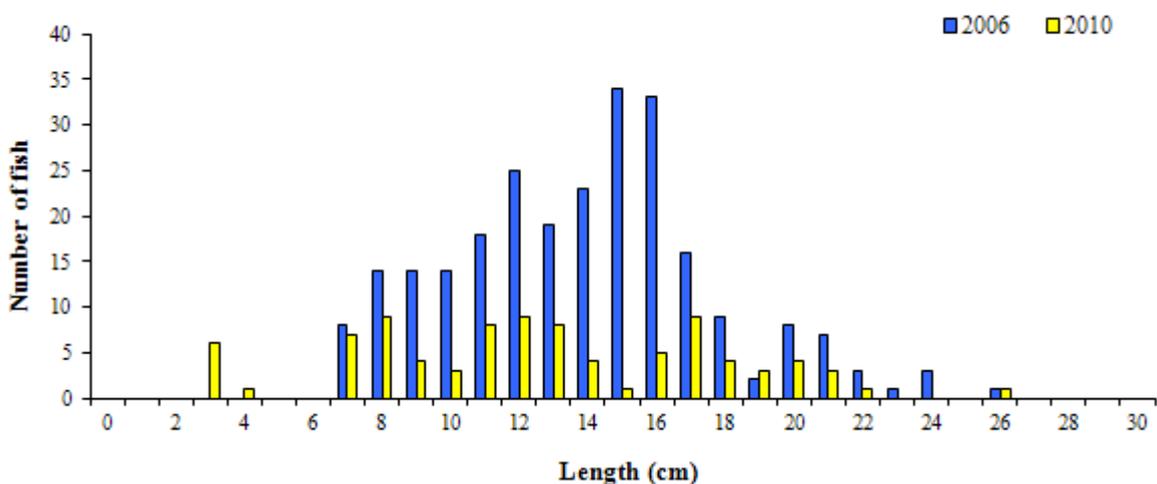
Fig. 1.6. Length frequency of perch captured on Lough Macnean Lower

1.3.4 Fish age and growth

Five age classes of roach were present, ranging from 2+ to 6+, with a mean L1 of 3.1cm (Table 1.3). In the 2006 survey, roach ranged from 0+ to 10+ with a mean L1 of 3.1cm. The dominant age classes in 2010 were 3+ and 4+ which corresponded to the 12 to 15cm length class (Fig. 1.5). The dominant age class in 2006 was 2+ corresponding to the 8cm to 10cm length class (Fig. 1.5).

Seven age classes of perch were present, ranging from 0+ to 6+, with a mean L1 of 5.1cm (Table 1.4). In the 2006 survey, perch ranged from 1+ to 10+ with a mean L1 of 5.6cm.

Seven age classes of roach x bream hybrids were present, ranging from 2+ to 8+, two age classes of bream were present, ranging from 7+ to 10+ and the two rudd captured were aged 4+.

Table 1.3. Mean (±SE) roach length (cm) at age for Lough Macnean Lower, July 2010

	L_1	L_2	L_3	L_4	L_5	L_6
Mean	3.1 (0.1)	7.2 (0.2)	11.1 (0.2)	14.2 (0.3)	16.5 (0.3)	18.0 (0.3)
N	36	36	33	22	15	2
Range	2.1-5.1	5.7-9.4	8.3-13.1	10.5-16.4	14.3-19.4	17.8-18.3

Table 1.4. Mean (±SE) perch length (cm) at age for Lough Macnean Lower, July 2010

	L_1	L_2	L_3	L_4	L_5	L_6
Mean	5.1 (0.1)	8.8 (0.1)	13.1 (0.3)	16.1 (0.6)	18.1 (0.8)	19.4 (0.8)
N	64	47	30	21	10	2
Range	4.0-6.3	6.9-11.1	9.8-17.3	11.3-20.7	15.6-24.2	18.6-20.2

1.4 Summary

Roach was the dominant species in terms of abundance (CPUE) and eel was the dominant species in terms of biomass (BPUE).

The mean roach CPUE in Lough Macnean Lower was not significantly different from any of the other four similar lakes surveyed. Roach ranged in age from 2+ to 6+, with no younger age classes being recorded.

The mean perch CPUE in Lough Macnean Lower was relatively low when compared to the other three similar lakes assessed; however, this was not statistically significant. Perch ranged in age from 0+ to 6+ indicating reproductive success in each of the previous seven years.

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. Using the FIL2 classification tool, Lough Macnean Lower has been assigned an ecological status of Poor/Bad in both 2006 and 2010 based on the fish populations present.

In the 2007 to 2009 surveillance monitoring reporting period, the EPA assigned Lough Macnean Lower an overall ecological status of Moderate, based on all monitored physico-chemical and biological elements, including fish. This status classification will be revised at the end of 2012.
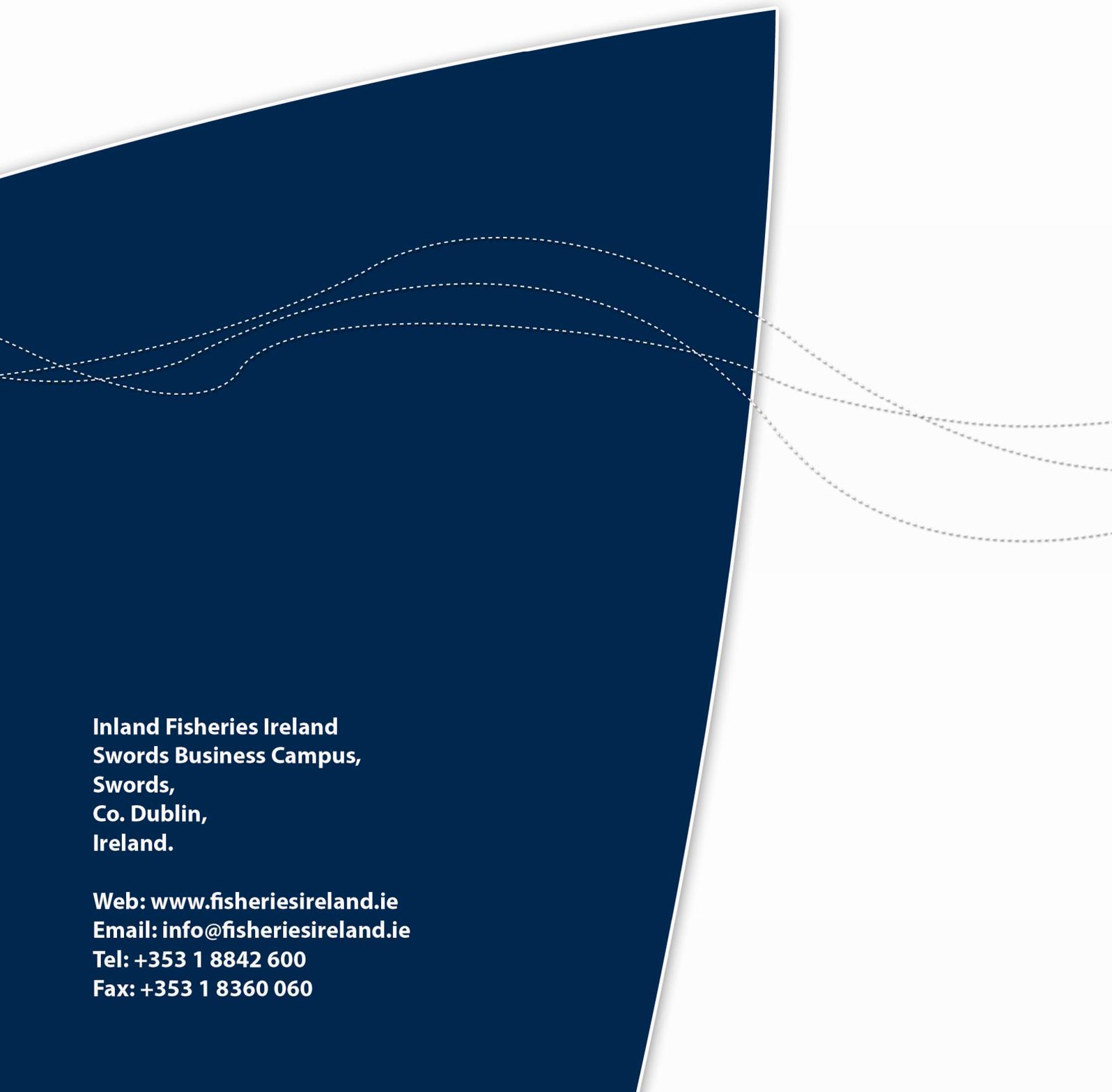
1.5 References

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NIEA (2009a) http://www.ni-environment.gov.uk/print/landscape/country_landscape/5/5-land.htm

NIEA (2009b) Wetlands and Lakes http://www.ni-environment.gov.uk/print/land-home/landscape_home/country_landscape/5/5-bio.htm