

# National Research Survey Programme

*Lakes 2015*

## Inniscarra Reservoir





Inland Fisheries Ireland

National Research Survey Programme

**Fish Stock Survey of Inniscarra Reservoir,  
August 2015**

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



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## 1.1 Introduction

Inniscarra Reservoir is located 11km to the west of Cork City on the River Lee system (Plate 1.1). The reservoir encompasses an area of 489 hectares and was created by the Electricity Supply Board (ESB) in 1956, with the construction of two dams on the Lee at Carraigadrohid (21m high) and Inniscarra (44m high) (Fitzpatrick and Bree, 2001). It is one of the largest waters in the Southwest region of Ireland, with its linear shape providing *circa* 40km of shoreline. The Reservoir is situated in a primarily agricultural area, with some industrial activity in the form of quarrying on its southern and northern shores. The reservoir supports a number of water-based activities including boating and sailing. A designated site for water-skiing is located at the mouth of the Dripsey Arm on the north western shore. The reservoir is also the site of the National Rowing Centre. Swimming is also very popular on the north western shoreline.

With its diverse fish stocks and its close proximity to Cork City, Inniscarra Reservoir is a popular angling destination with both domestic and international anglers. . The fish species present in the reservoir have altered significantly since it was created in 1956. The River Lee (a predominantly salmonid river) provided the initial stocks of brown trout, which were enhanced with fingerling stocking by the Inland Fisheries Trust (IFT) in the 1960s. During this period, species such as pike also thrived in the new water environment. A pike control program was operated by the IFT during the 1960's, but in the 1970's the reservoir was designated as a mixed coarse fishery and this control program ceased. A population of adult bream was introduced into Carrigadrohid Reservoir in 1974. In the 1980's this stock of bream had spread downstream and was discovered at Inniscarra Reservoir by the angling community.

In 2005 the reservoir was surveyed as part of a fish stock assessment by IFI's research section using seven-panel benthic braided survey gill nets. This study found that the fish stocks were dominated by a large population of small to medium sized bream, with healthy stocks of perch, roach x bream hybrids, rudd and pike also present. Seven fish species were recorded in total (CFB, 2005). In 2008, IFI conducted a follow-up fish stock assessment of Inniscarra Reservoir using the netting protocol developed for IFIs Water Framework Directive (WFD) fish surveillance monitoring programme in lakes. Perch was the most abundant species found in 2008 followed by bream, eels, gudgeon, roach x bream hybrids, roach, brown trout, rudd, pike, salmon, sea trout and tench (CFB, 2008).

The current survey had two objectives:

1. Assess the status of the fish stocks in the reservoir as part of IFIs national brown trout and coarse fish research programmes.

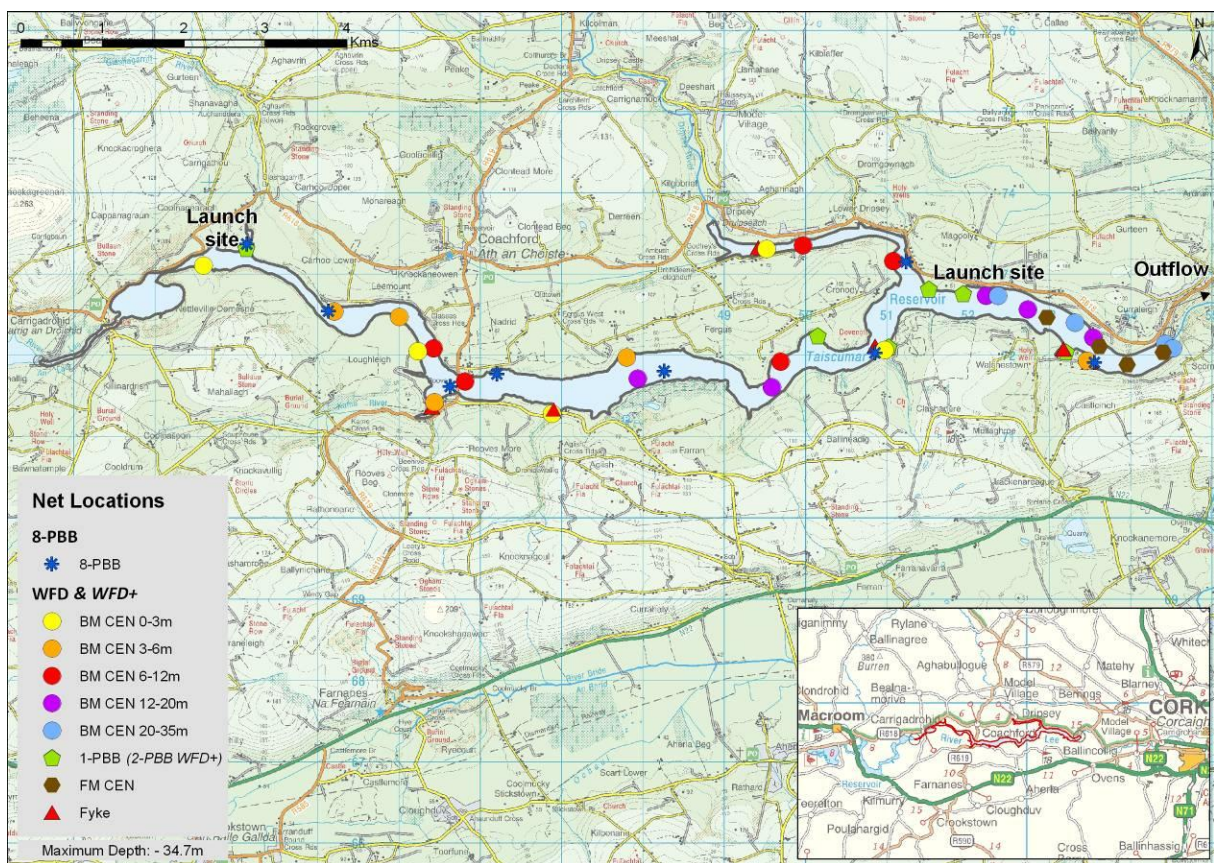
2. Undertake a method intercalibration exercise using the existing WFD multi method approach (benthic and floating multimesh monofilament survey gill nets, fyke nets, but adding supplementary two panel braided survey gill nets instead of one panel braided survey gill nets (WFD+)) and the method established by IFI in the late 1970s to assess the status of brown trout in lakes (seven panel braided survey gill nets), but adding an additional 88.90mm panel to these latter nets (8-PBB).

This report summarises the results of the 2015 fish stock survey (e.g. species composition, abundance and age structure) on Inniscarra Reservoir using both methods above, while the method intercalibration results will be dealt with in a separate report.



**Plate 1.1. Inniscarra Reservoir**





**Fig. 1.1. Location map of Inniscarra Reservoir showing locations and depths of each net (outflow is indicated on map)**



## **1.2 Methods**

### ***1.2.2 Netting methods***

Inniscarra Reservoir was surveyed over four nights between the 17<sup>th</sup> and the 21<sup>st</sup> of August 2015. A total of 6 Dutch fyke nets (Fyke), 24 benthic monofilament multi-mesh (12 panel, 5-55mm mesh knot to knot) CEN standard survey gill nets (BM CEN) and 4 surface floating monofilament multi-mesh (FM CEN) (12 panel, 5-55mm mesh knot to knot) CEN standard survey gill nets were deployed in the lake. The netting effort was supplemented using 6 two-panel benthic braided (63.5mm and 88.9mm mesh knot to knot) survey gill nets (1-PBB or 2-PBB).

In addition 8 eight-panel benthic braided survey gill nets (8-PBB) were deployed on the lake. These survey gill nets are composed of eight 27.5m long panels each a different mesh size, tied together randomly. The panels ranged from 2" (50.8mm stretched mesh, 25.4mm mesh knot to knot) to 5" (127mm stretched mesh, 63.5mm mesh knot to knot) in half inch (12.7mm) increments (O'Grady, 1981) with the addition of a 7" (177.8mm stretched mesh, 88.9mm mesh knot to knot) panel.

The nets were deployed in the same locations as randomly chosen in the previous surveys. The site locations for additional survey gill nets 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 also randomised.

All fish apart from perch were measured and weighed on site and scales were removed from all brown trout, bream, pike, roach, hybrids, and salmon. 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 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 and one type of hybrid were recorded on Inniscarra Reservoir in August 2015, with 858 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Perch was the most abundant fish species recorded, followed by roach, roach x bream hybrids, bream, gudgeon, eels, brown trout, pike and salmon (Table 1.1). During the previous surveys in 2005 and 2008 the same species composition was recorded with the exception of rudd, tench and sea trout which were captured during the 2008 survey but were not recorded during the 2005 and 2015 surveys (CFB, 2005 and 2008).

**Table 1.1. Number of each fish species captured by each gear type during the survey on Inniscarra Reservoir, August 2015**

Scientific name	Common name	Number of fish captured					
		8-PBB	2-PBB	BM CEN	FM CEN	Fyke	Total
<i>Perca fluviatilis</i>	Perch	35	0	221	0	7	263
<i>Rutilus rutilus</i>	Roach	42	0	143	36	0	221
<i>Rutilus rutilus x Abramis brama</i>	Roach x bream hybrid	118	0	62	1	0	181
<i>Abramis brama</i>	Bream	52	14	22	0	1	89
<i>Gobio gobio</i>	Gudgeon	0	0	70	0	0	70
<i>Salmo trutta</i>	Brown trout	6	4	3	2	0	15
<i>Esox lucius</i>	Pike	5	1	1	0	1	8
<i>Salmo salar</i>	Salmon	0	1	0	0	0	1
<i>Anguilla anguilla</i>	European eel	0	0	0	0	10	10

### 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 or as mean number of fish per net (8-PBB). 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 are summarised in Table 1.2.

Perch and roach were the two most dominant fish species in terms of abundance (CPUE) (Table 1.2).





**Table 1.2. Mean (S.E.) CPUE and BPUE (per metre of net) for all fish species captured on Inniscarra Reservoir, 2015**

Scientific name	Common name	8-PBB (	WFD+ **
<b>Mean CPUE (±S.E.)</b>			
<i>Perca fluviatilis</i>	Perch	0.020 (0.005)	0.187 (0.050)
<i>Rutilus rutilus</i>	Roach	0.024 (0.010)	0.149 (0.038)
<i>Rutilus rutilus x Abramis brama</i>	Roach x bream hybrid	0.067 (0.029)	0.053 (0.013)
<i>Abramis brama</i>	Bream	0.030 (0.010)	0.025 (0.007)
<i>Gobio gobio</i>	Gudgeon	-	0.058 (0.022)
<i>Salmo trutta</i>	Brown trout	0.003 (0.002)	0.006 (0.003)
<i>Esox lucius</i>	Pike	0.003 (0.002)	0.002 (0.001)
<i>Salmo salar</i>	Salmon	-	0.000 (0.000)
<i>Anguilla anguilla</i>	European eel	-	0.028 (0.028)*
<b>Mean BPUE (±S.E.)</b>			
<i>Perca fluviatilis</i>	Perch	-	13.486 (4.207)
<i>Rutilus rutilus x Abramis brama</i>	Roach x bream hybrid	-	4.735 (1.397)
<i>Rutilus rutilus</i>	Roach	-	6.607 (1.727)
<i>Abramis brama</i>	Bream	-	8.784 (2.907)
<i>Gobio gobio</i>	Gudgeon	-	0.563 (0.211)
<i>Salmo trutta</i>	Brown trout	-	7.300 (5.896)
<i>Esox lucius</i>	Pike	-	2.379 (1.653)
<i>Salmo salar</i>	Salmon	-	1.245 (1.245)
<i>Anguilla anguilla</i>	European eel	-	6.831 (6.831)*

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

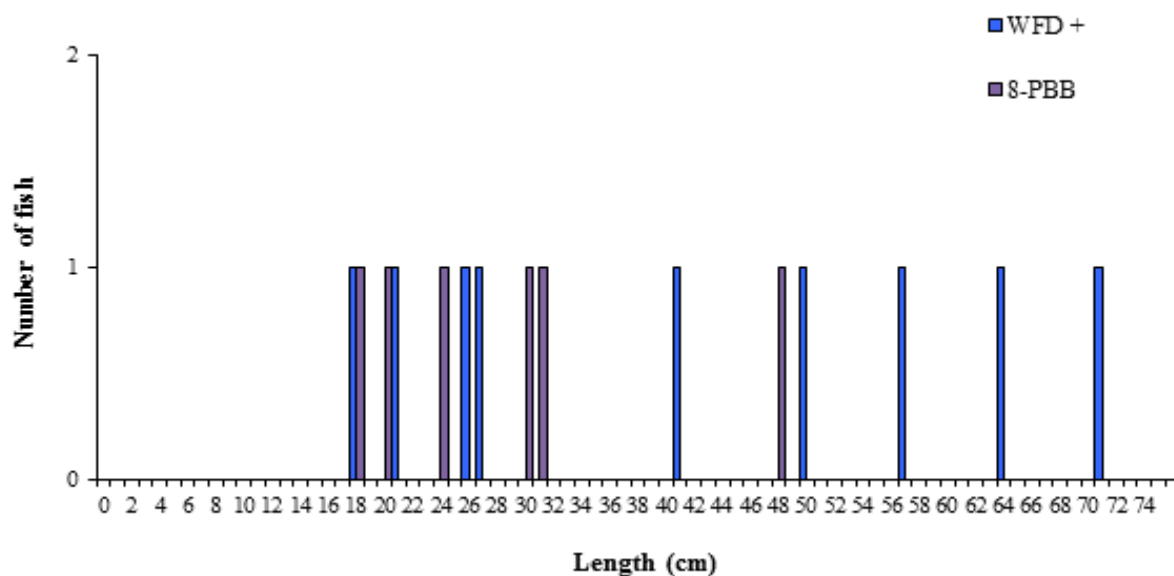
\*\*CPUE and BPUE data above for all fish species except eels are not comparable to earlier WFD surveys as an extra panel was added to the 2-PBB to provide additional information on large coarse fish.



### 1.3.3 Length frequency distributions and growth

#### **Brown trout**

Brown trout captured during the 2015 survey ranged in length from 18.2cm to 71.0cm (mean = 36.9cm) (Fig. 1.2). Six age classes were present, ranging from 2+ to 7+, with a mean L1 of 5.6cm (Table 1.3). Mean brown trout L4 in 2015 was 30.0cm indicating a fast rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971) (Table 1.3).



**Fig. 1.2. Length frequency of brown trout captured on Inniscarra Reservoir, 2015**

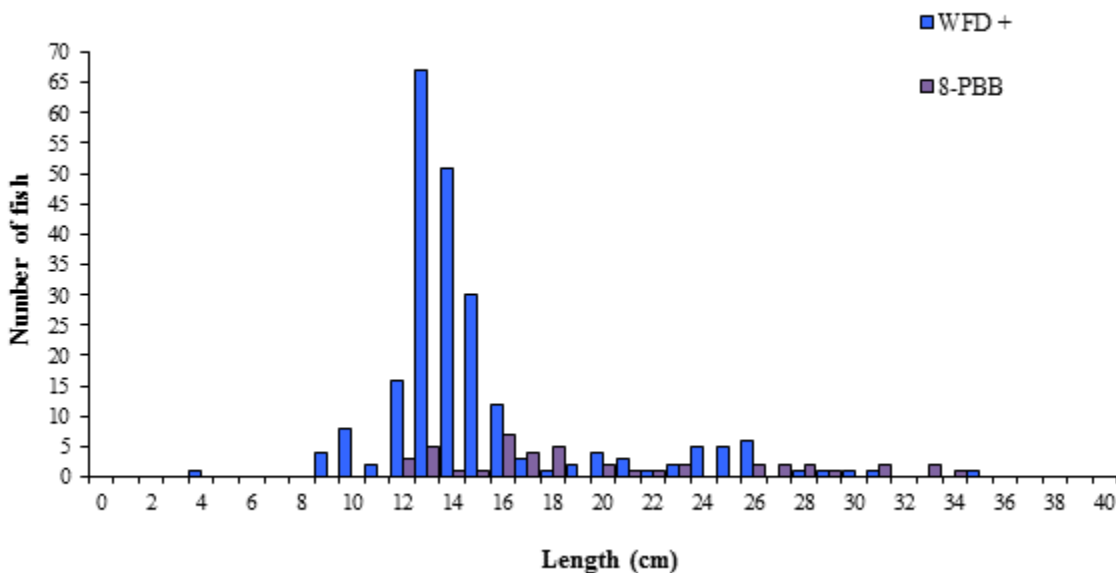
**Table 1.3. Mean ( $\pm$ S.E.) brown trout length (cm) at age for Inniscarra Reservoir, August 2015**

	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>	L <sub>6</sub>	L <sub>7</sub>	Growth Category
Mean ( $\pm$ S.E.)	5.6 (0.3)	12.4 (0.4)	19.8 (0.7)	30.0 (1.5)	41.6 (1.3)	51.5 (0.4)	57.4	Fast
N	14	14	12	6	4	2	1	
Range	4.3-7.2	9.4-14.7	15.2-23.2	23.5-34.4	38.4-44.6	51.1-51.9	57.4-57.4	



## Perch

Perch captured during the 2015 survey ranged in length from 4.3cm to 35.0cm (mean = 16.3cm) (Fig.1.3) with six age classes present, ranging from 1+ to 6+ with a mean L1 of 6.6cm (Table 1.4). The dominant age class was 2+ (Fig. 1.3).



**Fig. 1.3. Length frequency of perch captured on Inniscarra Reservoir, 2015**

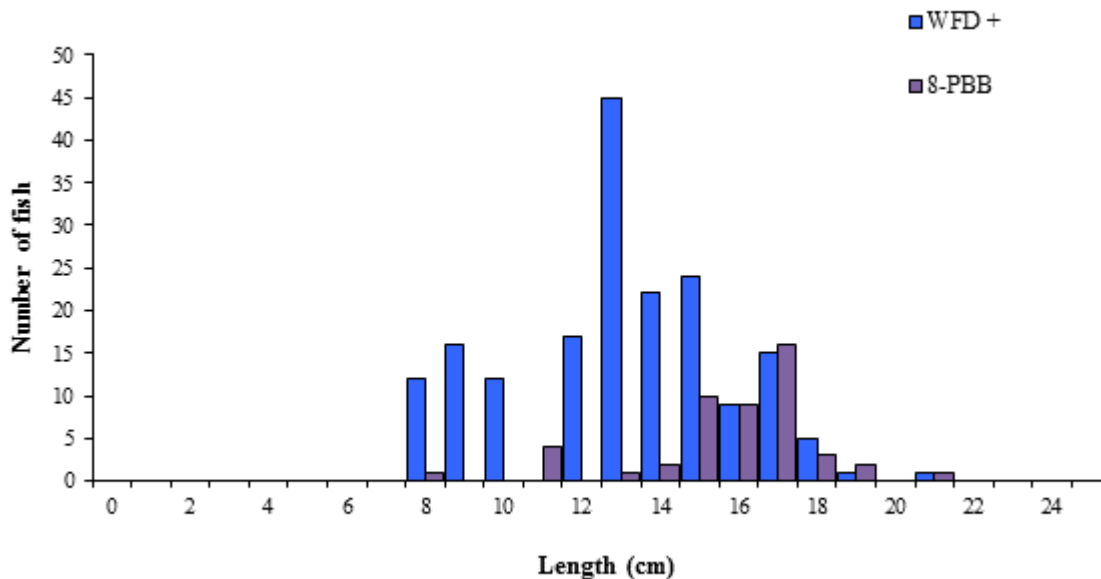
**Table 1.4. Mean ( $\pm$ S.E.) perch length (cm) at age for Inniscarra Reservoir, August 2015**

	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>	L <sub>6</sub>
Mean ( $\pm$ S.E.)	6.6 (0.1)	12.5 (0.3)	16.5 (0.4)	19.7 (0.6)	22.9 (0.7)	24.2 (1.3)
N	49	43	29	23	20	12
Range	4.8-9.4	7.7-18.2	13.0-21.0	15.2-25.3	18.7-31.0	19.1-33.4



### **Roach:**

Roach captured during the 2015 survey ranged in length from 8.0cm to 21.6cm (mean = 14.0cm) (Fig.1.4) with five age classes present, ranging from 2+ to 6+ with a mean L1 of 6.6cm (Table 1.5). The dominant age class was 3+ (Fig.1.4).



**Fig. 1.4. Length frequency of roach captured on Inniscarra Reservoir, 2015**

**Table 1.5. Mean ( $\pm$ S.E.) roach length (cm) at age for Inniscarra Reservoir, August 2015**

	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>	L <sub>6</sub>
Mean ( $\pm$ S.E.)	3.3 (0.1)	6.5 (0.2)	10.2 (0.3)	14.2 (0.5)	17.2 (0.4)	19.0 (0.9)
N	39	39	29	16	10	4
Range	2.2-4.6	4.0-9.7	6.6-14.0	11.6-18.3	15.0-19.6	17.3-20.6

### **Other fish:**

Eels captured during the 2015 survey ranged in length from 27.6cm to 71.0cm. Bream ranged in length from 12.3cm to 36.3cm, gudgeon ranged in length from 4.0cm to 14.2cm, pike ranged from 20.4cm to 71.8cm and roach x bream hybrids ranged from 3.9cm to 30.1cm. One salmon captured was aged 2.1+ and measured 62.5cm.

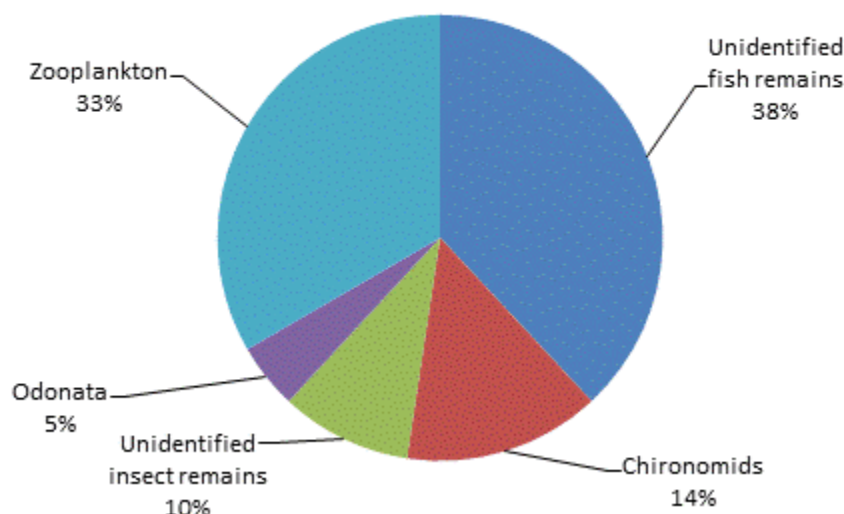


### 1.3.4 Stomach and diet analysis

Feeding 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.

#### 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). The food items recorded in perch stomachs during the survey were dominated by fish remains and zooplankton (Fig 1.5).



**Fig. 1.5. Diet of perch captured on Inniscarra Reservoir 2015 (% occurrence) n=18**

### 1.4 Summary and ecological status

Perch was the dominant species in terms of abundance (CPUE) captured in the survey gill nets during the 2015 survey.

Brown trout ranged in length from 18.2cm to 71.0cm and ranged in age from 2+ to 7+ indicating reproductive success in six of the previous eight years. Length at age analyses revealed that brown trout in the lake exhibit a fast rate of growth according to the classification scheme of Kennedy and Fitzmaurice (1971).



Perch ranged in length from 4.3cm to 35.0cm and ranged in age from 1+ to 6+, indicating reproductive success in six of the previous seven years. The dominant age class was 2+.

Roach ranged in length from 8.0cm to 21.6cm and ranged in age from 2+ to 6+, indicating reproductive success in five of the previous seven 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 by 2015 if Ireland is not to incur penalties.

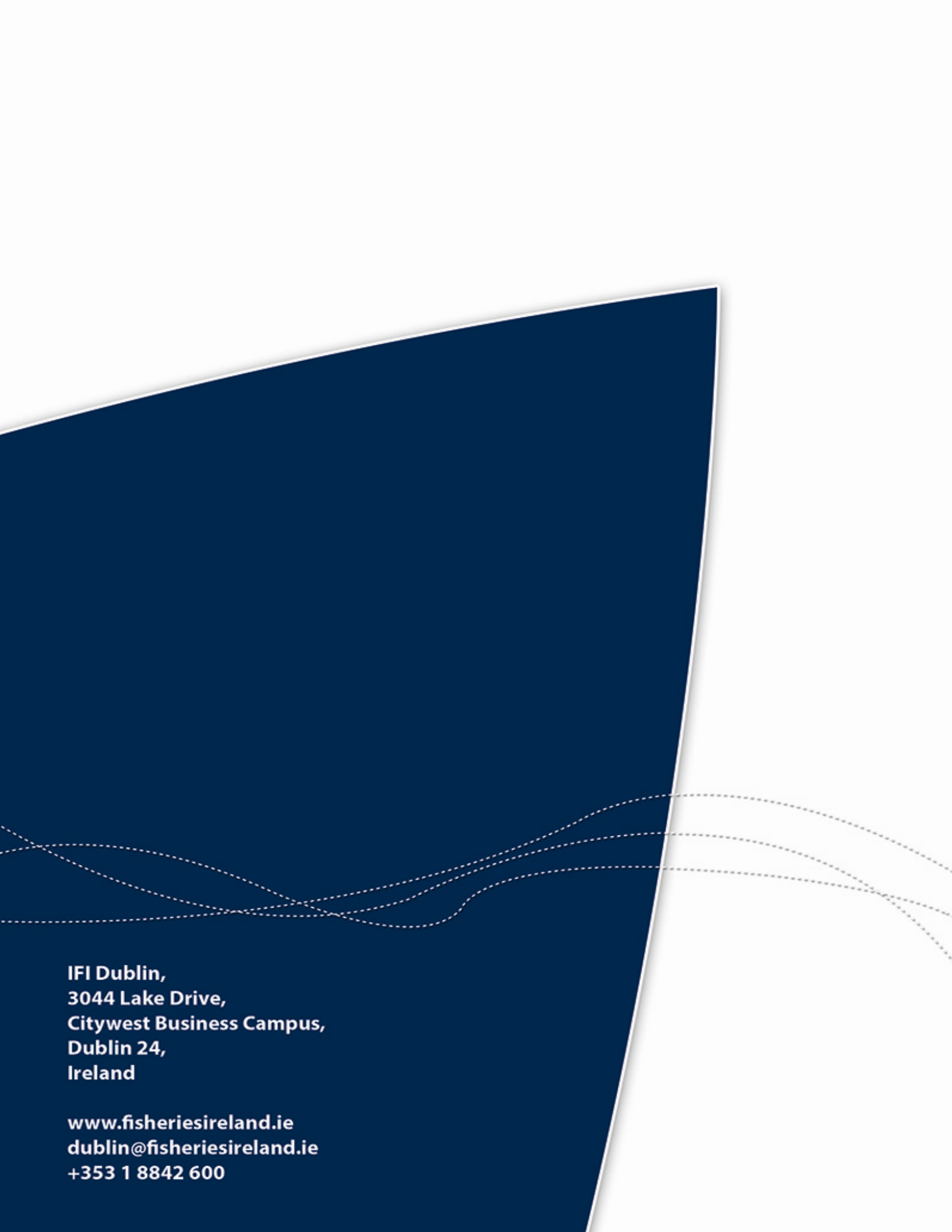
A multimetric fish ecological classification tool (Fish in Lakes – ‘FIL’) was developed for the island of Ireland (Ecoregion 17) using IFI and Agri-Food and Biosciences Institute Northern Ireland (AFBINI) data generated during the NSSHARE Fish in Lakes project (Kelly *et al.*, 2008). This tool was further 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.*, 2012b). Using the FIL2 classification tool, Inniscarra Reservoir has been assigned an ecological status of Bad for 2008 and Moderate for 2015 based on the fish populations present.

In the 2010 to 2012 surveillance monitoring reporting period, the EPA assigned Inniscarra Reservoir an overall draft ecological status of Moderate, based on all monitored physico-chemical and biological elements, including fish. This status classification will be revised during 2016.



## 1.5 References

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