



# Sampling Fish for the Water Framework Directive

*Lakes 2012*

**Lough Sessiagh**



Iascach Intíre Éireann  
Inland Fisheries Ireland

## Water Framework Directive Fish Stock Survey of Lough Sessiagh, July 2012

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## 1.1 Introduction

Lough Sessiagh is a small lowland lake situated 3.5km south-east of Dunfanaghy, on the outskirts of Port na Blagh in Co. Donegal (Plate 1.1, Fig. 1.1). The geology of the area is predominantly quartzite, however on the western side of the lake, the bedrock contains more base-rich units, including units of dolomitic marble (DOEHLG, 2005). The lake is bordered on its northern, western and eastern edge by houses and agricultural lands, with steep cliffs bordering the southern shore (NPWS, 1998). The lake has a stony bottom comprised of metamorphic bedrock and has a barren appearance.

Lough Sessiagh has an area of 20.9ha, a mean depth of 4m and a maximum depth of 22m. The lake is categorised as typology class 7 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. deep (>4m), less than 50ha and moderately alkaline (20-100mg/l CaCO<sub>3</sub>). It has been classed as 2a (i.e. expected to meet good status by 2015 pending further investigation) in the WFD Characterization report (EPA, 2005).

Lough Sessiagh has been designated as a Special Area of Conservation (NPWS, 1998). It comprises a habitat listed under Annex I of the EU Habitats Directive, i.e. lowland oligotrophic lake, and also provides suitable habitat for a rare plant species, the slender naiad (*Najas flexilis*), which is a legally protected aquatic plant listed under Annex II of the Habitats Directive (NPWS, 1998).

Brown trout is the dominant fish species in Lough Sessiagh. Arctic char, a rare freshwater fish species listed in the Irish Red Data book of threatened vertebrates as vulnerable (King *et al.*, 2011), is also present. Brown trout spawning is limited to a single narrow inflowing stream on the south-west shore (Fig. 1.1). The water is alkaline and has excellent clarity (O'Reilly, 2007). The lake was previously surveyed in 1995 (Whelan *et al.*, 1996).

The lake was also previously surveyed in 2006 and 2009 as part of the NSSHARE Fish in Lakes Project (Kelly *et al.*, 2007) and as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al.*, 2010). In both years brown trout was found to be the dominant species, followed by Arctic char, three-spined stickleback and eel.





Plate 1.1. Lough Sessiagh

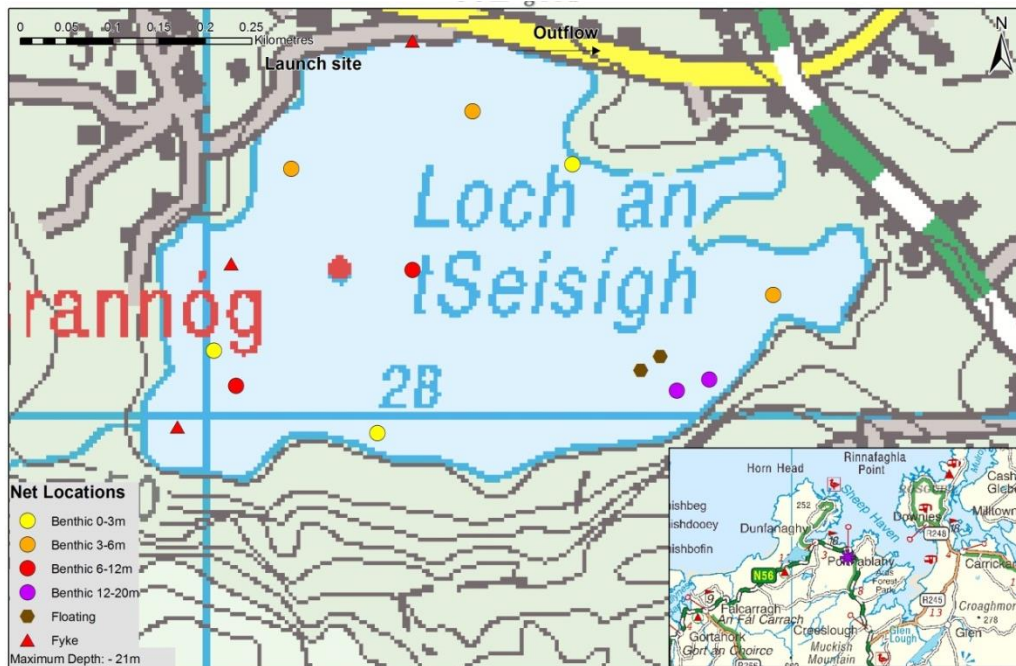


Fig. 1.1. Location map of Lough Sessiagh showing locations and depths of each net (outflow is indicated on map)

## 1.2 Methods

Lough Sessiagh was surveyed over two nights between the 9<sup>th</sup> and the 11<sup>th</sup> of July 2012. A total of three sets of Dutch fyke nets, ten benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (3 @ 0-2.9m, 3 @ 3-5.9m, 2 @ 6-11.9m and 2 @ 12-19.9m) and two surface monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed randomly in the lake (15 sites). Nets were deployed in the same locations as were randomly selected in the previous surveys in 2009 and 2006. 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 trout and Arctic char. 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.

## 1.3 Results

### 1.3.1 Species Richness

A total of four fish species were recorded on Lough Sessiagh in July 2012, with 977 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Brown trout was the most abundant fish species recorded, followed by three-spined stickleback, Arctic char and eels. A similar species composition was recorded during the previous survey in 2009 (Kelly *et al.*, 2010).

**Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Sessiagh, July 2012**

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	40	1	1	42
<i>Salvelinus alpinus</i>	Arctic char	8	0	0	8
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	931	0	8	939
<i>Anguilla anguilla</i>	European eel	0	0	8	8

### ***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 2009 and 2012 are summarised in Table 1.2. Mean CPUE and BPUE for all fish species is illustrated in Figures 1.2 and 1.3.

Although the mean brown trout CPUE and BPUE were slightly higher in 2012 than in 2009, these differences were not statistically significant (Fig. 1.2 and Fig. 1.3).

The differences in the mean brown trout CPUE and BPUE between Lough Sessiagh and another similar lake was assessed, with no overall significant differences being found (Fig. 1.4 and Fig. 1.5).

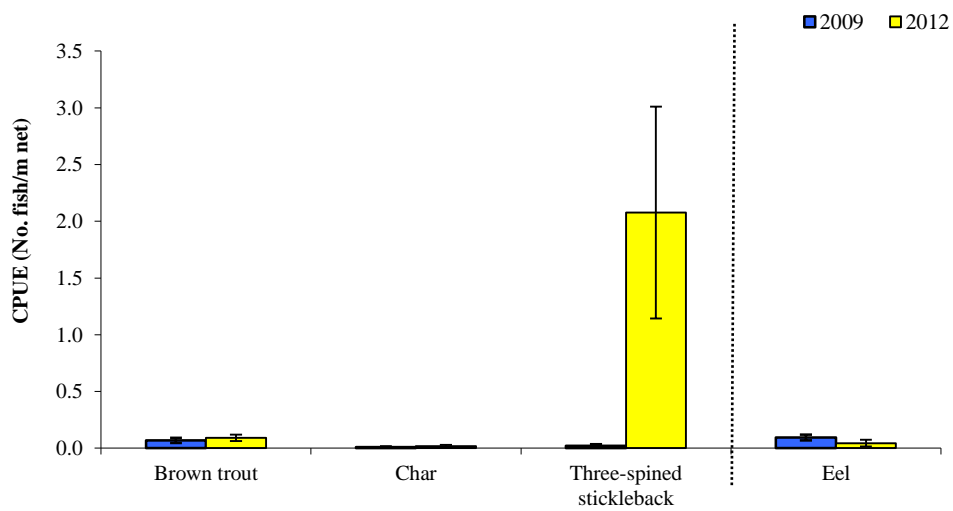
Although the mean Arctic char CPUE and BPUE were also higher in 2012 than in 2009, these differences were not statistically significant (Fig. 1.2 and Fig. 1.3).

The differences in the mean Arctic char CPUE and BPUE between Lough Sessiagh and three similar lakes was assessed, with overall significant differences being found (Kruskal-Wallis,  $P < 0.05$ ) (Fig. 1.6 and Fig. 1.7). However, Independent-Samples Mann-Whitney U tests between each lake showed that the mean Arctic char CPUE and BPUE of Lough Sessiagh was not significantly different from the other similar lakes assessed.

**Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Sessiagh, 2009 and 2012**

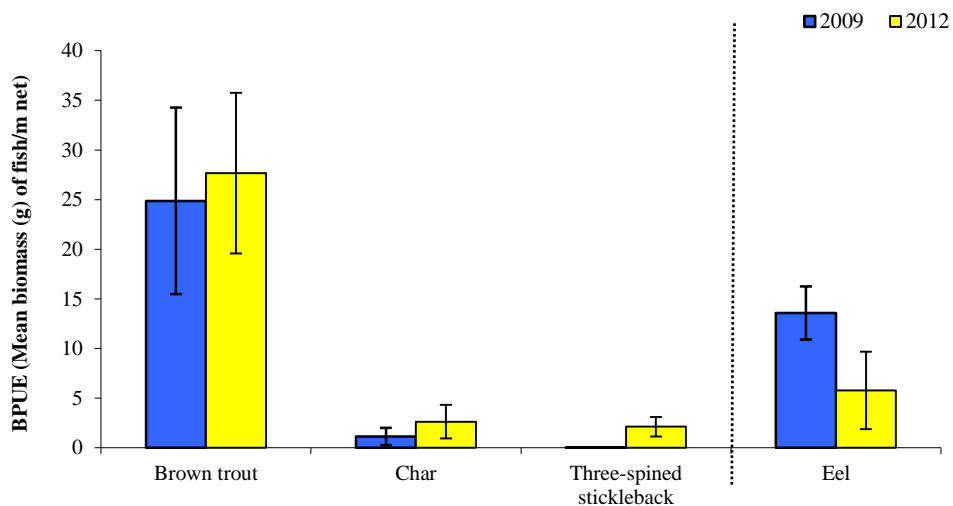
Scientific name	Common name	2009	2012
<b>Mean CPUE</b>			
<i>Salmo trutta</i>	Brown trout	0.069 (0.022)	0.092 (0.028)
<i>Salvelinus alpinus</i>	Arctic char	0.009 (0.007)	0.018 (0.012)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.022 (0.012)	2.078 (0.933)
<i>Anguilla anguilla</i>	European eel	0.094 (0.024)	0.044 (0.294)
<b>Mean BPUE</b>			
<i>Salmo trutta</i>	Brown trout	24.876 (9.404)	27.668 (8.092)
<i>Salvelinus alpinus</i>	Arctic char	1.144 (0.872)	2.634 (1.691)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.015 (0.009)	2.126 (0.973)
<i>Anguilla anguilla</i>	European eel	13.578 (2.670)	5.778 (3.898)

\* On the rare occasion where biomass data was unavailable for an individual fish, this was determined from a length/weight regression for that species.

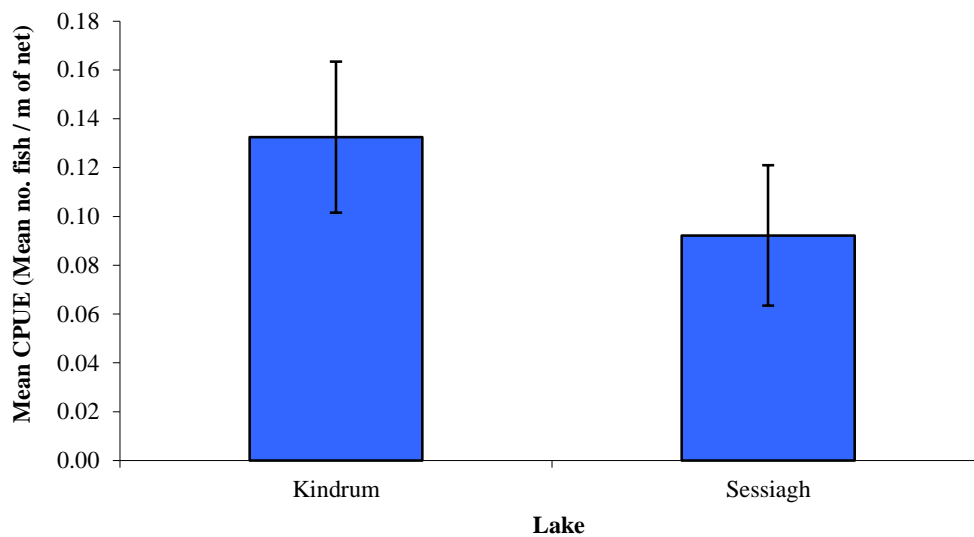


**Fig. 1.2. Mean ( $\pm$ S.E.) CPUE for all fish species captured in Lough Sessiagh (Eel CPUE based on fyke nets only), 2009 and 2012**

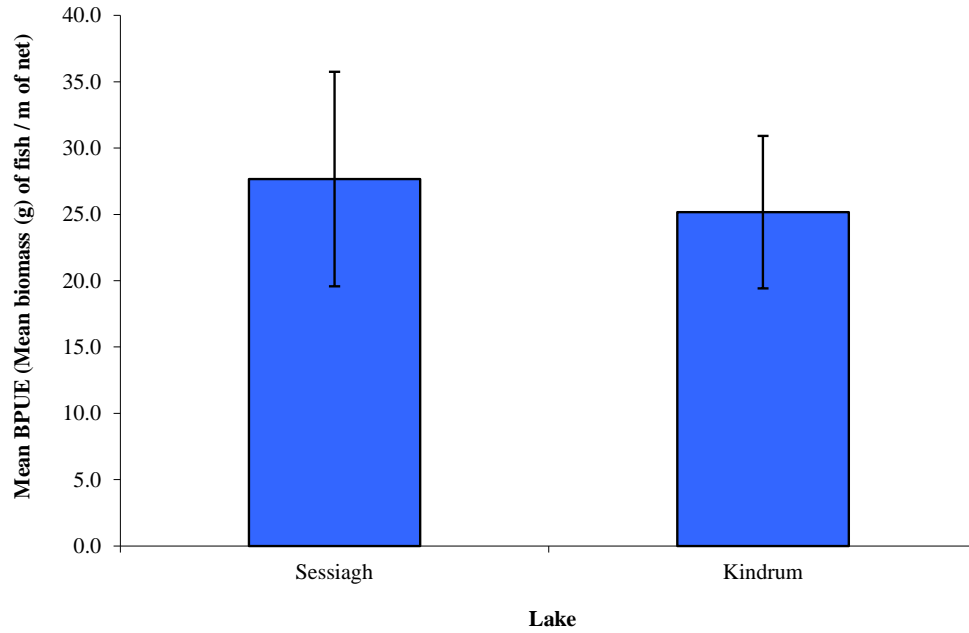




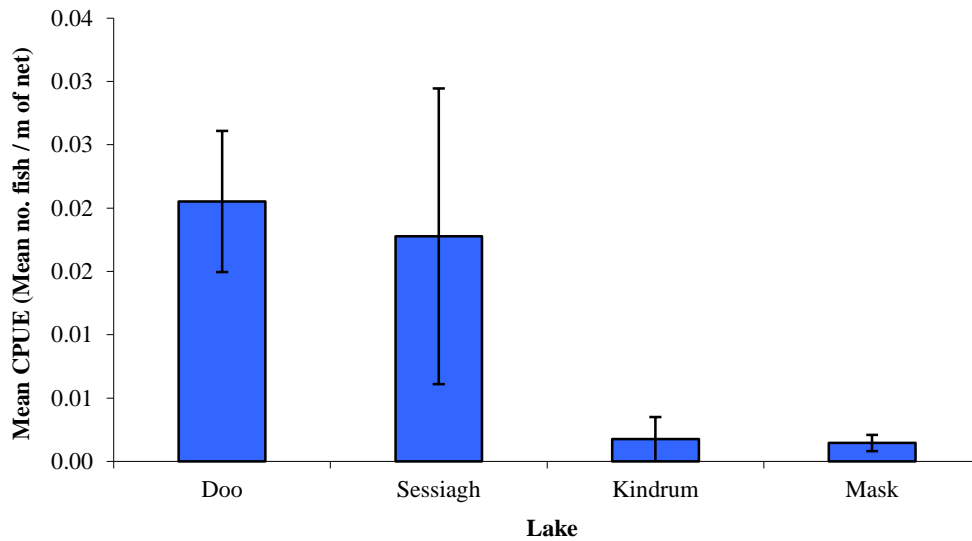
**Fig. 1.3. Mean ( $\pm$ S.E.) BPUE for all fish species captured in Lough Sessiagh (Eel BPUE based on fyke nets only), 2009 and 2012**



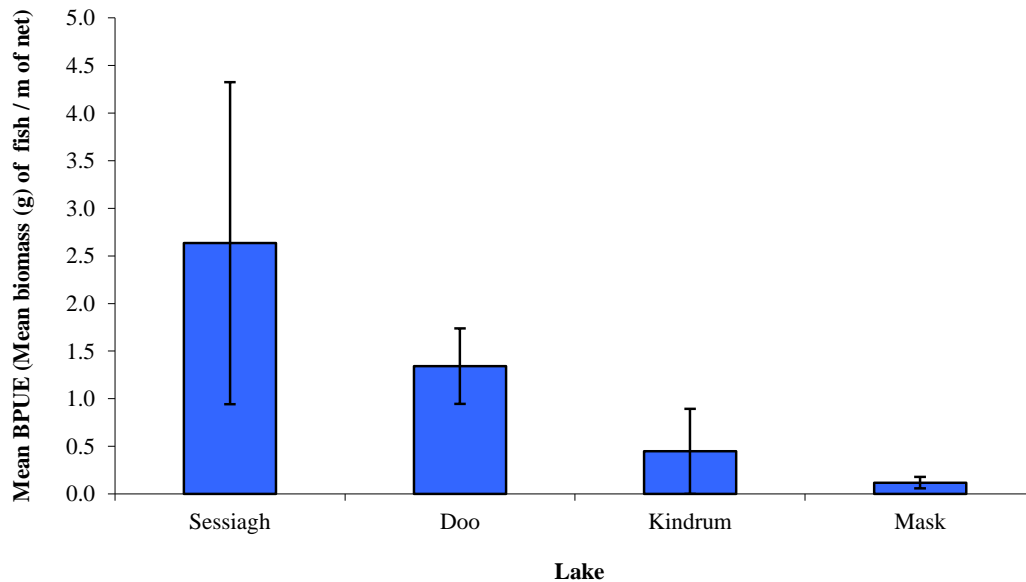
**Fig. 1.4. Mean ( $\pm$ S.E.) brown trout CPUE in two lakes surveyed during 2012**



**Fig. 1.5. Mean ( $\pm$ S.E.) brown trout BPUE in two lakes surveyed during 2012**



**Fig. 1.6. Mean ( $\pm$ S.E.) Arctic char CPUE in four lakes surveyed during 2012**



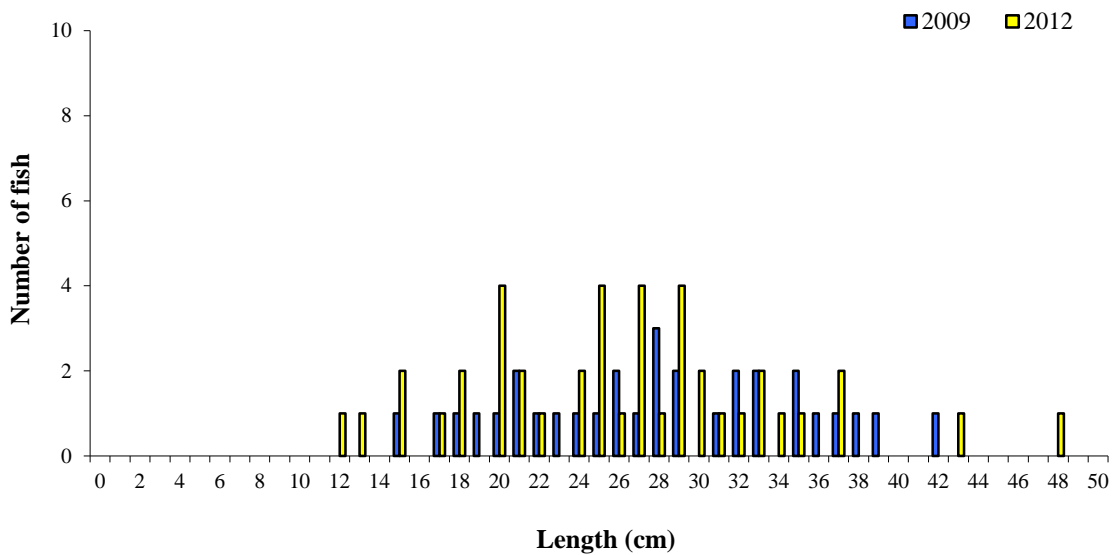
**Fig. 1.7. Mean ( $\pm$ S.E.) Arctic char BPUE in four lakes surveyed during 2012**

### *1.3.3 Length frequency distributions*

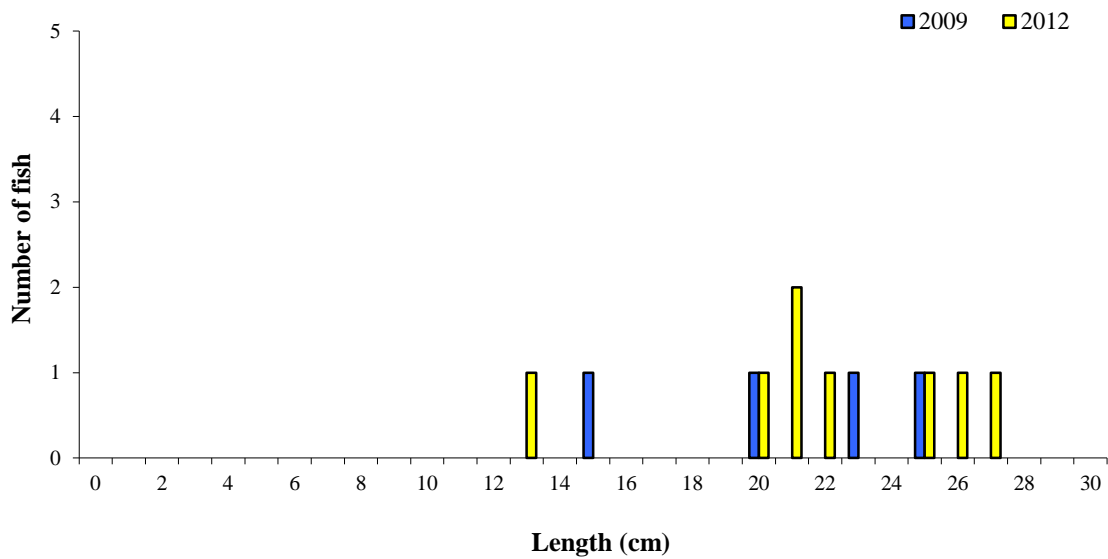
Brown trout captured during the 2012 survey ranged in length from 12.0cm to 48.0cm (mean = 26.6cm) (Fig. 1.6). Brown trout captured during the 2009 survey ranged in length from 15.0cm to 42.5cm (Fig. 1.6).

Arctic char captured during the 2012 survey ranged in length from 13.8cm to 27.6cm (mean = 22.3cm) (Fig. 1.7). Arctic char captured during the 2009 survey ranged in length from 15.4cm to 25.2cm (Fig. 1.7).

Eels captured during the 2012 survey ranged in length from 32.4cm to 53.5cm and three-spined stickleback ranged in length from 3.5cm to 7.0cm.



**Fig. 1.6. Length frequency of brown trout captured on Lough Sessiagh, 2009 and 2012**



**Fig. 1.7. Length frequency of Arctic char captured on Lough Sessiagh, 2009 and 2012**

### 1.3.4 Fish age and growth

Six age classes of brown trout were present, ranging from 1+ to 7+, with a mean L1 of 8.1cm (Table 1.3). In the 2009 survey, brown trout ranged from 1+ to 5+ with a mean L1 of 7.8cm. Mean brown trout L4 in 2012 was 35.2cm indicating a very fast rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971).

Two age classes of Arctic char were present, 2+ and 4+. In the 2009 survey, Arctic char ranged from 1+ to 2+.

**Table 1.3. Mean ( $\pm$ SE) brown trout length (cm) at age for Lough Sessiagh, July 2012**

	<b>L<sub>1</sub></b>	<b>L<sub>2</sub></b>	<b>L<sub>3</sub></b>	<b>L<sub>4</sub></b>	<b>L<sub>5</sub></b>	<b>L<sub>6</sub></b>	<b>L<sub>7</sub></b>
Mean	8.1 (0.3)	21.4 (0.9)	27.6 (1.4)	35.2 (2.1)	40.1 (3.2)	40.5	42.2
N	41	30	11	4	3	1	1
Range	4.0-11.4	8.9-27.5	17.7-34.5	31.8-41.1	35.9-46.4	40.5-40.5	42.2-42.2

### 1.4 Summary

Three-spined stickleback was the dominant species in terms of abundance (CPUE) and brown trout was the dominant species in terms of biomass (BPUE) captured in the survey gill nets.

Although the mean brown trout CPUE and BPUE in Lough Sessiagh was slightly higher in 2012 than in the 2009 survey, these differences were not statistically significant. The mean brown trout CPUE and BPUE in Lough Sessiagh was similar to another lake assessed during 2012, with no statistically significant differences being found between lakes. Brown trout ranged in age from 1+ 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 very fast rate of growth according to the classification scheme of Kennedy and Fitzmaurice (1971).

Although the mean Arctic char CPUE and BPUE in Lough Sessiagh was slightly higher in 2012 than in the 2009 survey, these differences were not statistically significant. The mean Arctic char CPUE and BPUE in Lough Sessiagh was similar to the other lakes assessed during 2012, with no statistically significant differences being found between lakes. Arctic char ranged in age from 2+ to 4+, indicating reproductive success in two of the previous five 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 (Kelly *et al.*, 2012). Using the FIL2 classification tool, Lough Sessiagh has been assigned an ecological status of High based on the fish populations present in 2012. The ecological status assigned to the lake based on the 2009 survey data was Good.

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

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