



Sampling Fish for the Water Framework Directive

Lakes 2012

Doo Lough



Iascach Intíre Éireann
Inland Fisheries Ireland

Water Framework Directive Fish Stock Survey of Doo Lough, October 2012

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

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1.1 Introduction

Doo Lough (Plate 1.1, Fig. 1.1) is located approximately 6km north-west of Leenaun, Co. Mayo. It is one of four lakes situated in the Delphi fishery - Fin, Doo, Glencullin and Cunne. Glencullin Lough, located directly above Doo Lough, flows into Doo Lough via a short stream. Doo Lough in turn drains into Fin Lough which is connected to Killary Harbour via the Bundorragha River.

The lake is approximately 3.5km in length and up to 750m wide. It has a surface area of 155ha, a maximum depth of 46m and an altitude of 30m a.s.l. The lake falls into typology class 4 (as designated by the EPA for the Water Framework Directive), i.e. deep (mean depth >4m), greater than 50ha and low alkalinity (<20mg/l CaCO₃).

Doo Lough forms part of the Mweelrea/Sheefry/Erriff candidate Special Area of Conservation complex (NPWS, 2005). The site has been selected for containing active blanket bog, lagoons, machair, decalcified dunes and petrifying springs - all priority habitats on Annex I of the E.U. Habitats Directive. The site is also selected for containing the following species listed on Annex II of the same Directive - freshwater pearl mussel, Atlantic salmon, otter, the snails *Vertigo angustior* and *V. geyeri*, the plant slender naiad and the liverwort petalwort (NPWS, 2005).

Doo Lough is an oligotrophic lake (NPWS, 2005) and was once famous for its sea trout fishery, which has been in decline since the late 1980s due to problems with sea lice. Doo Lough holds brown trout, sea trout, Arctic char and gets both a spring and grilse salmon run (O'Reilly, 2007).

The lake was also previously surveyed in October 2009 as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al.*, 2010). During this survey, brown trout were found to be the dominant species present in the lake. Arctic char, sea trout, three-spined stickleback, salmon and eels were also captured during the survey.



Plate 1.1. Doo Lough

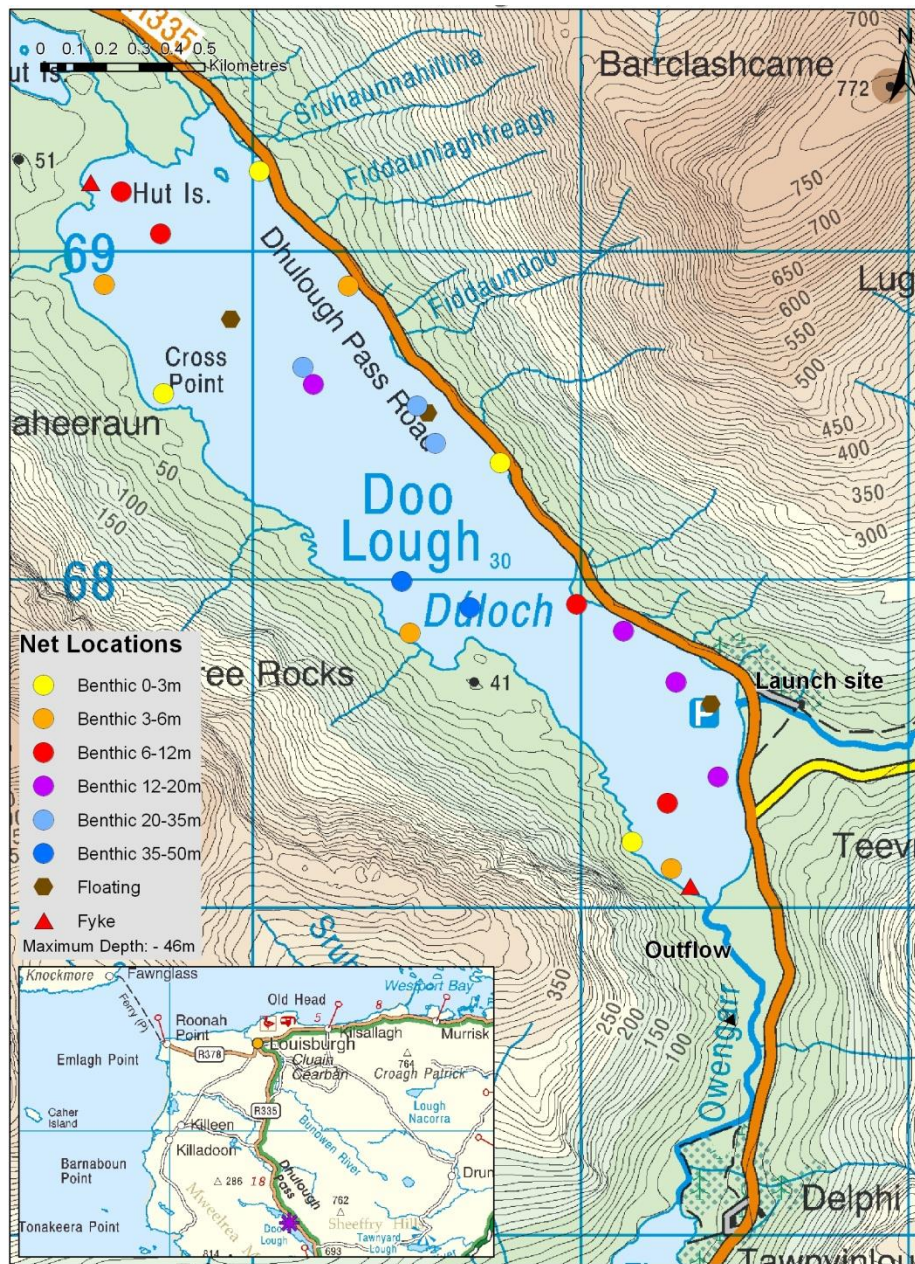


Fig. 1.1. Location map of Doo Lough showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

Doo Lough was surveyed over two nights between the 2nd and the 4th of October 2012. A total of two sets of Dutch fyke nets, 21 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (4 @ 0-2.9m, 4 @ 3-5.9m, 4 @ 6-11.9m, 4 @ 12-19.9m, 3 @ 20-34.9m and 2 @ 35-49.9m) and three surface monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed randomly in the lake (three sites). Nets were deployed in the same locations as were randomly selected in the previous survey in 2009. 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, Arctic char 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.

1.3 Results

1.3.1 Species Richness

A total of five fish species (sea trout are included as a separate ‘variety’ of trout) were recorded in Doo Lough in October 2012, with 146 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 Arctic char, sea trout, salmon, eels and three-spined stickleback. A similar species composition was recorded during the previous survey in 2009. For information regarding the previous 2009 survey refer to Kelly *et al.*, 2010.

Table 1.1. Number of each fish species captured by each gear type during the survey on Doo Lough, October 2012

Scientific name	Common name	Number of fish captured			
		Benthic mono multimesh gill nets	Surface mono multimesh gill nets	Fyke nets	Total
<i>Salmo trutta</i>	Brown trout	99	3	8	110
	Sea trout	9	0	1	10
<i>Salmo salar</i>	Salmon	3	0	0	3
<i>Salvelinus alpinus</i>	Arctic char	16	0	0	16
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	1	0	0	1
<i>Anguilla anguilla</i>	European eel	1	5	0	6

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 appeared higher in 2012 than in 2009, this difference was not statistically significant (Fig. 1.2).

The mean brown trout BPUE was significantly higher in 2012 than in 2009, (Mann-Whitney, $P < 0.05$) (Fig. 1.3).

The differences in the mean brown trout CPUE and BPUE between Doo Lough and two similar lakes was assessed, with overall significant differences being found (Kruskal-Wallis $P < 0.05$) (Fig. 1.4 and Fig. 1.5). Independent-Samples Mann-Whitney U tests between each lake showed that Doo Lough had a significantly lower mean brown trout CPUE and BPUE than Lough Anure ($P < 0.05$) and Lough Dan ($P < 0.05$).

Although the mean Arctic char CPUE and BPUE appeared slightly different 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 Doo Lough and three similar lakes was assessed, with overall significant differences being found (Kruskal-Wallis $P < 0.05$) (Fig. 1.6 and Fig. 1.7). Independent-Samples Mann-Whitney U tests between each lake showed that Doo Lough had a significantly higher mean Arctic char CPUE and BPUE than Kindrum Lough ($P < 0.05$) and Lough Mask ($z = 3.07$, $P < 0.05$ and $z = 3.03$, $P < 0.05$).

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

Scientific name	Common name	2009	2012
Mean CPUE			
<i>Salmo trutta</i>	Brown trout	0.057 (0.018)	0.136 (0.034)
	Sea trout	0.011 (0.004)	0.012 (0.004)
<i>Salmo salar</i>	Salmon	0.001 (0.001)	0.003 (0.002)
<i>Salvelinus alpinus</i>	Arctic char	0.023 (0.005)	0.021 (0.005)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.006 (0.003)	0.001 (0.001)
<i>Anguilla anguilla</i>	European eel	0.016 (0.016)	0.041 (0.025)
Mean BPUE			
<i>Salmo trutta</i>	Brown trout	3.437 (1.242)	7.072 (1.987)
	Sea trout	4.824 (1.839)	5.404 (2.292)
<i>Salmo salar</i>	Salmon	0.007 (0.007)	4.671 (3.229)
<i>Salvelinus alpinus</i>	Arctic char	1.135 (0.769)	1.342 (0.395)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.025 (0.012)	0.001 (0.001)
<i>Anguilla anguilla</i>	European eel	3.966 (3.966)	6.158 (4.675)

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

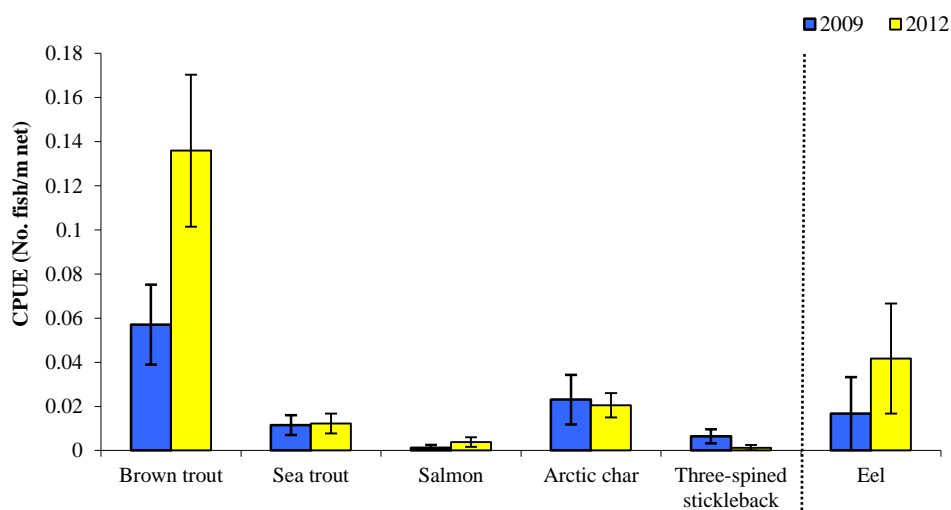


Fig. 1.2. Mean (\pm S.E.) CPUE for all fish species captured in Doo Lough (Eel CPUE based on fyke nets only), 2009 and 2012

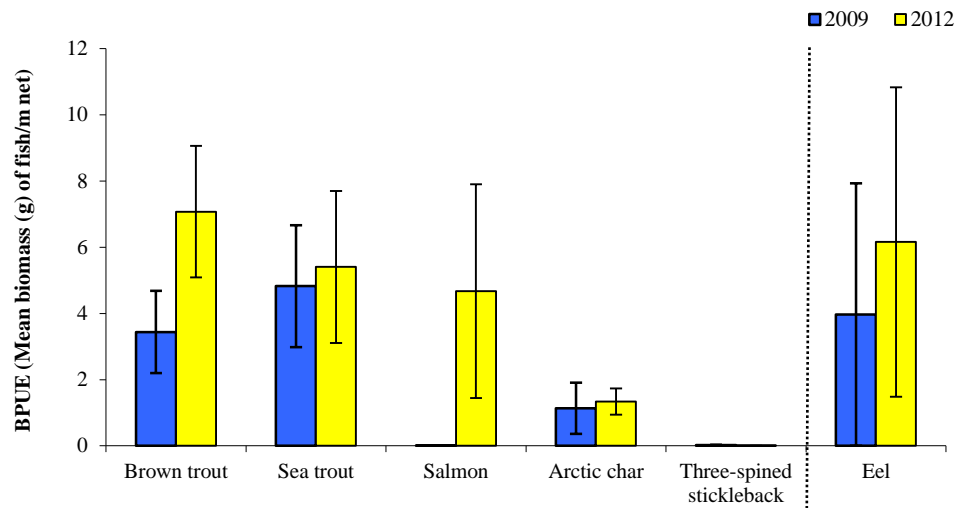


Fig. 1.3. Mean (\pm S.E.) BPUE for all fish species captured in Doo Lough (Eel BPUE based on fyke nets only), 2009 and 2012

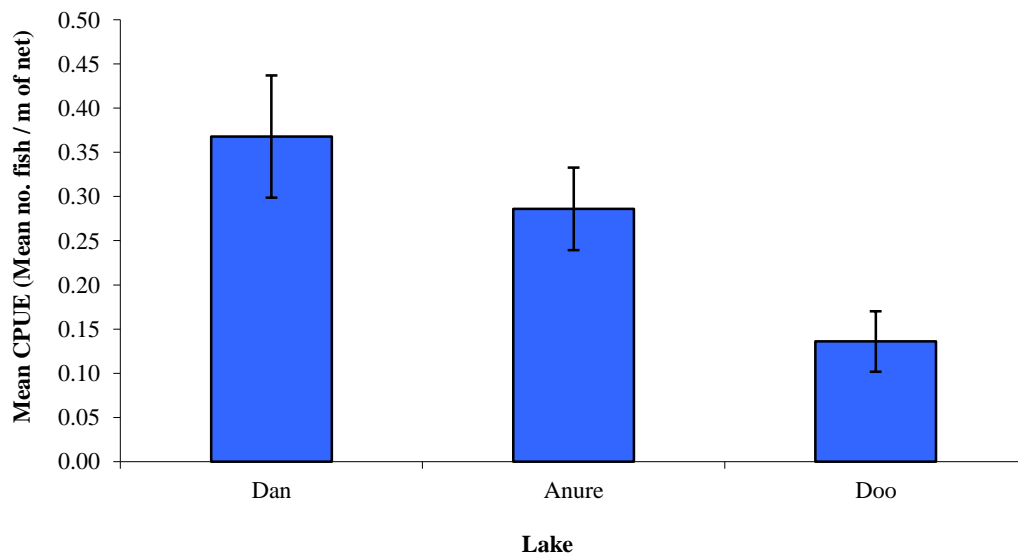


Fig. 1.4. Mean (\pm S.E.) brown trout CPUE in three lakes surveyed during 2012

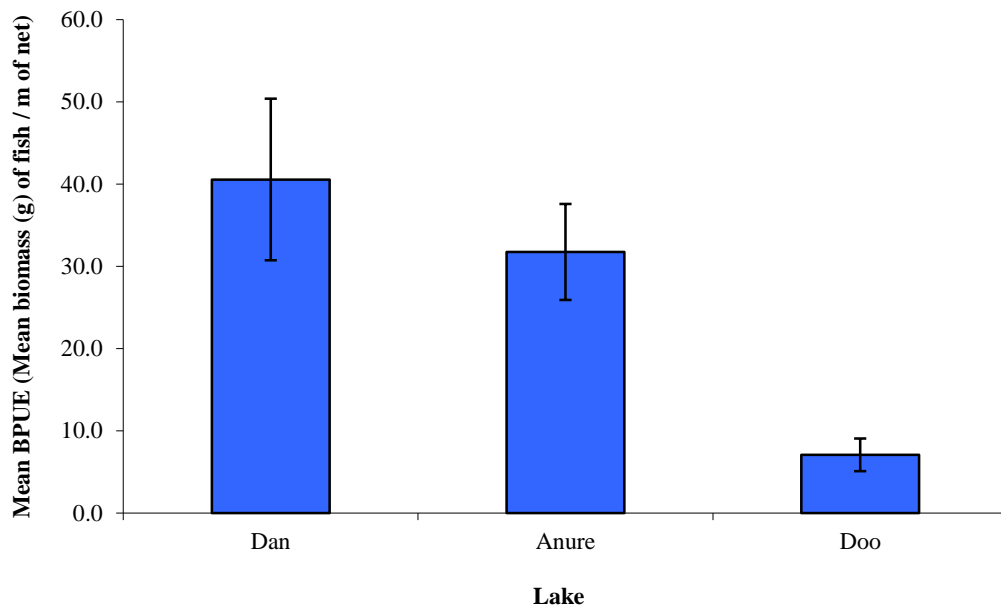


Fig. 1.5. Mean (\pm S.E.) brown trout BPUUE in three lakes surveyed during 2012

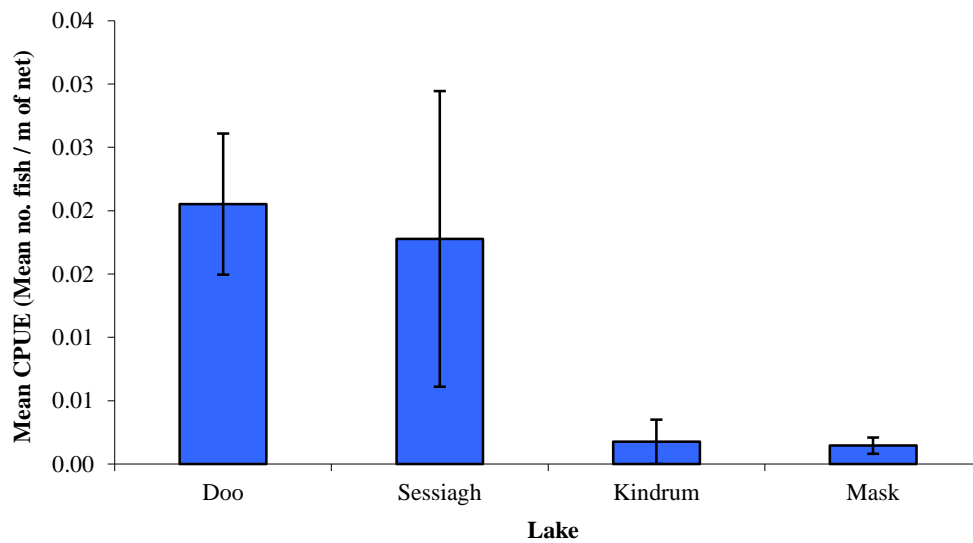


Fig. 1.6. Mean (\pm S.E.) Arctic char CPUE in four lakes surveyed during 2012

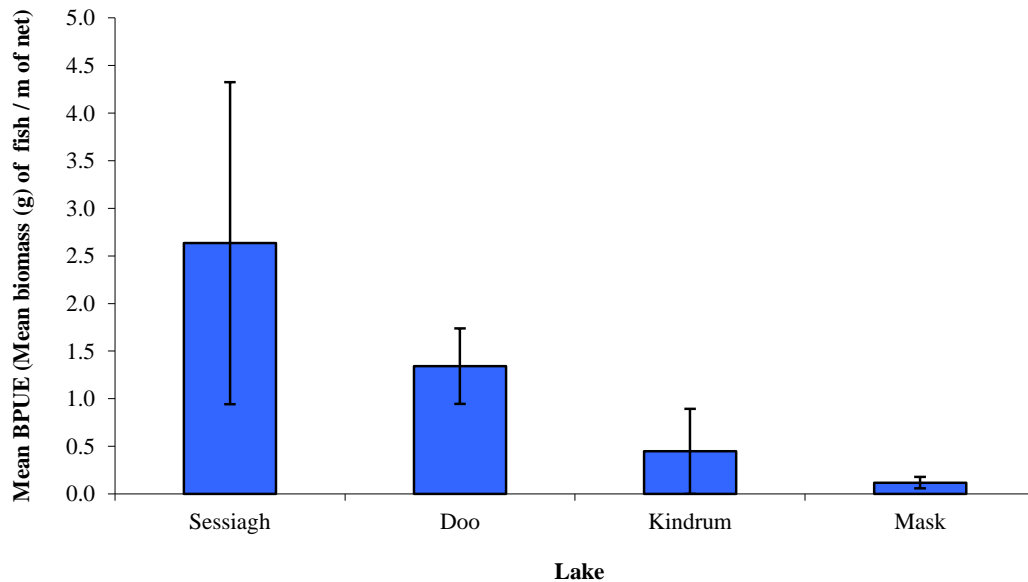


Fig. 1.7. Mean (\pm S.E.) Arctic char BPUE in four lakes surveyed during 2012

1.3.3 Length frequency distributions

Brown trout captured during the 2012 survey ranged in length from 7.2cm to 45.4cm (mean = 15.9cm) (Fig. 1.6). Brown trout captured during the 2009 survey ranged in length from 7.7cm to 26.5cm (Fig. 1.6).

Arctic char captured during the 2012 survey ranged in length from 10.0cm to 20.7cm (mean = 17.1cm) (Fig. 1.7). Arctic char captured during the 2009 survey ranged in length from 12.0cm to 20.5cm (Fig. 1.7).

Eels captured during the 2012 survey ranged in length from 37.5cm to 54.7cm, salmon ranged in length from 9.0cm to 56.5cm, sea trout ranged in length from 25.9cm to 42.6cm and one three-spined stickleback was recorded at 5.0cm.

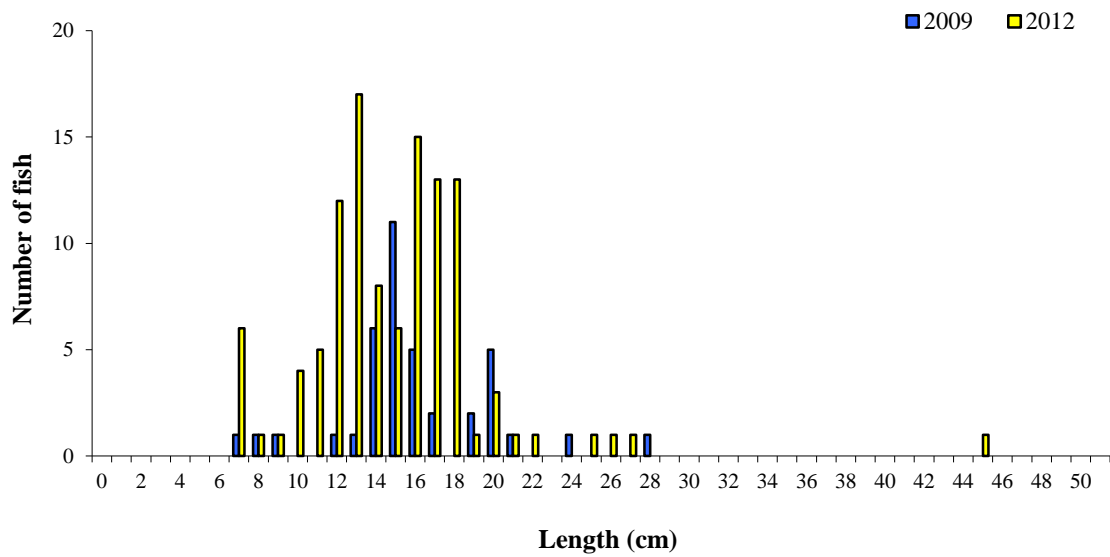


Fig. 1.6. Length frequency of brown trout captured on Doo Lough, 2009 and 2012

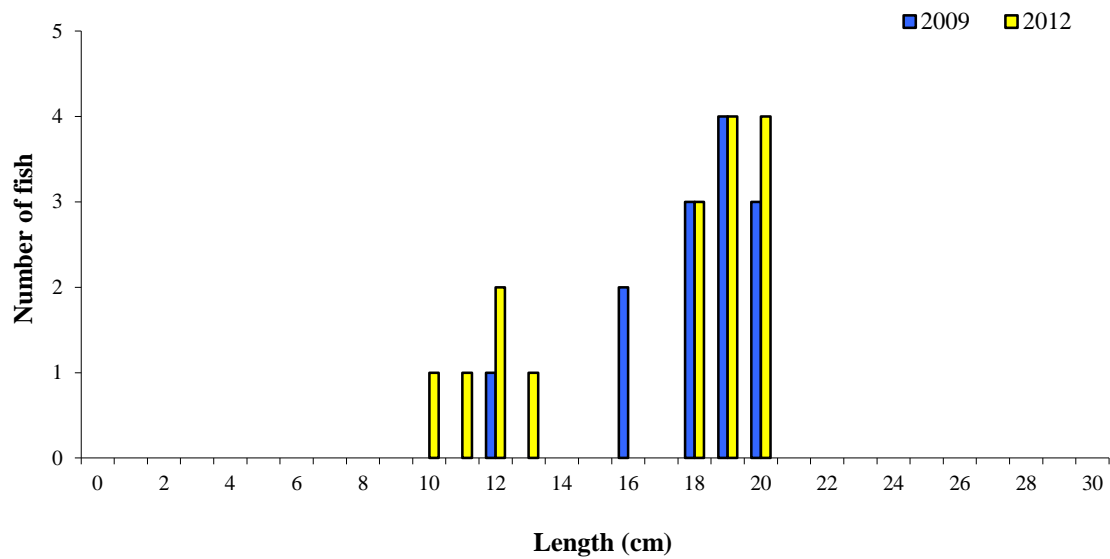


Fig. 1.7. Length frequency of Arctic char captured on Doo Lough, 2009 and 2012

1.3.4 Fish age and growth

Five age classes of brown trout were present, ranging from 0+ to 4+, with a mean L1 of 5.9cm (Table 1.3). In the 2009 survey, brown trout ranged from 0+ to 3+ with a mean L1 of 6.8cm. Mean brown trout L4 in 2011 was 24.7cm indicating a very slow rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971).

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

Table 1.3. Mean (\pm SE) brown trout length (cm) at age for Doo Lough, October 2012

	L₁	L₂	L₃	L₄
Mean	5.9 (0.2)	11.9 (0.4)	19.5 (0.2)	24.7 (0.9)
N	53	39	9	2
Range	3.7-10.2	7.6-18.7	13.2-33.7	23.8-25.6

1.4 Summary

Brown trout was the dominant species in terms of abundance (CPUE) and biomass (BPUE) captured in the survey gill nets.

Although the mean brown trout CPUE appeared higher in 2012 than in 2009, these differences were not statistically significant. However, the mean brown trout BPUE was significantly higher in 2012 than in the 2009 survey. The mean brown trout CPUE and BPUE in Doo Lough was significantly lower than Lough Anure and Lough Dan, other similar lakes surveyed. Brown trout ranged in age from 0+ to 4+, indicating reproductive success in the previous five years. 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 (1971).

Although the mean Arctic char CPUE and BPUE in Doo Lough appeared slightly different in 2012 than in the 2009 survey, these differences were not statistically significant. The mean Arctic char CPUE and BPUE in Doo Lough was significantly higher than Kindrum Lough and Lough Mask, other similar lakes surveyed. Arctic char ranged in age from 1+ to 4+, indicating reproductive success in four 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 (AFBNI) 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 Doo 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 also High.

In the 2007 to 2009 surveillance monitoring reporting period, the EPA assigned Lough Doo 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.

1.5 References

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