National Research Survey Programme

Lakes 2021

Lough Nasnahida

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Iascach Intíre Éireann
Inland Fisheries Ireland

Fish Stock Survey of Lough Nasnahida,

July 2021

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National Research Survey Programme

Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

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1. Introduction

Lough Nasnahida is located in western Donegal, close to the village of Doochary and approximately 10km southeast of Dungloe (Plate 1.1, Figure 1.1). It is a small oligotrophic lake on the Owenamarve system, situated at an altitude of 189m a.s.l., with an approximate area of 12.1ha and a maximum depth of 11m. It is located within the Cloghernagore Bog and Glenveagh National Park Special Area of Conservation (SAC). This is a particularly large SAC located in north-west Donegal containing many different habitats ranging from exposed rock and scree mountains to blanket bogs, lakes and rivers (NPWS, 20202017).

The lake is not heavily fished and appears to be in a natural state with good spawning streams (Gerry McCafferty IFI, *pers. comm*.). The lake is categorised as typology class 1 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. shallow (<4m), less than 50ha and low alkalinity (<20 mg/l CaCO3).

The lake has been surveyed on three occasions since 2009 (2009, 2012 and 2015) (Kelly *et al*., 2010, 2013 and 2016). Brown trout have dominated fish stocks on all recent survey occasions. Eels were also captured during each survey.

This report summarises the results of the 2021 fish stock survey carried out on the lake using Inland Fisheries Ireland's fish in lakes monitoring protocol. The protocol is WFD compliant and also provides insight into fish stock status in the lake.

Plate 1.1. Lough Nasnahida, July 2021

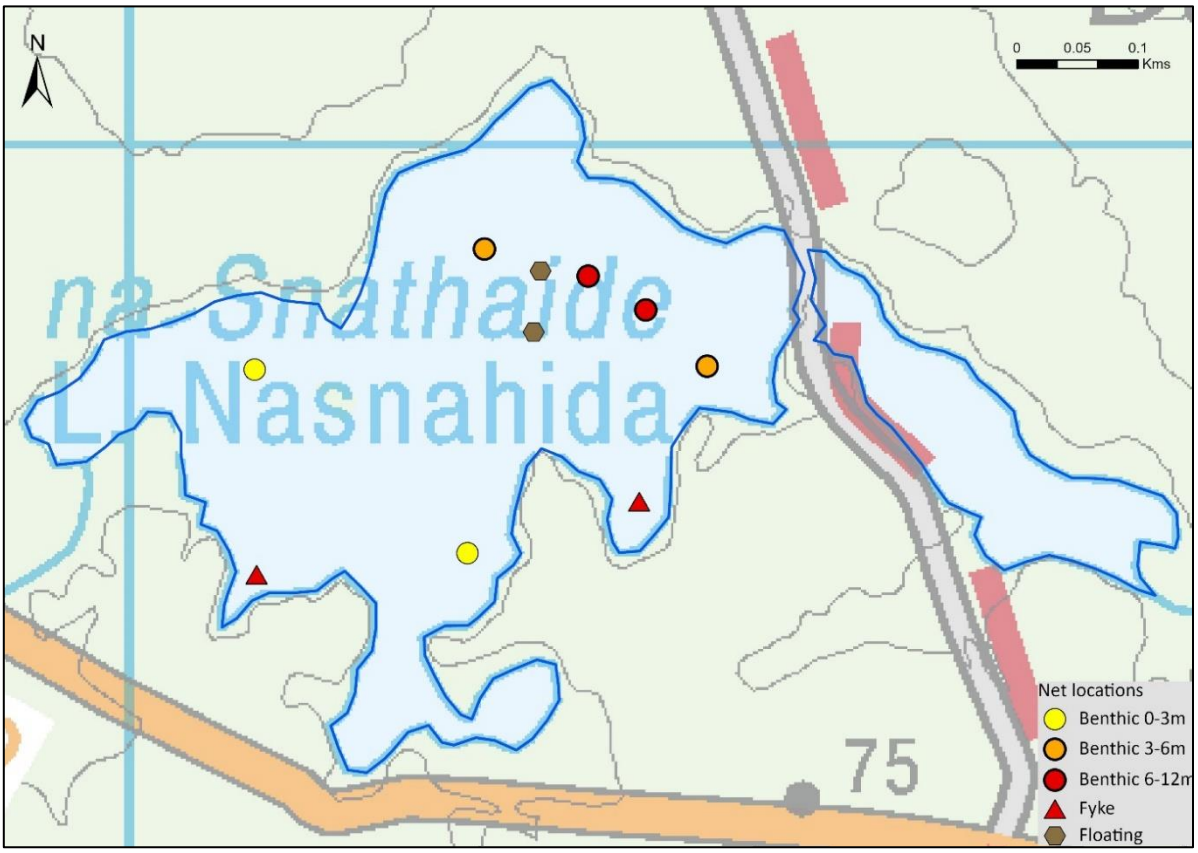

Figure 1.1. Location map of Lough Nasnahida showing locations and depths of each net

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2. Methods

2.1. Netting methods

Lough Nasnahida was surveyed over one night on the 26th July 2021. A total of two sets of Dutch fyke nets (fyke) and six benthic monofilament multi-mesh (BM CEN) (12 panel, 5-55mm mesh knot to knot) CEN standard survey gill nets (2 @ 0-2.9m, 2 @ 3-5.9m and 2 @ 6-11.9m) and two surface monofilament multi-mesh (FM CEN) (12 panel, 5-55mm mesh knot to knot) CEN standard survey gill nets were deployed randomly in the lake (10 sites). Survey nets were deployed in the same locations as were randomly selected in previous surveys. 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 a sample of all fish captured except eels. 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. Fish were frozen immediately after the survey and transported back to the IFI laboratory for later dissection.

2.2. Fish diet

Total stomach contents were inspected, and individual items were counted and identified to the lowest taxonomic level possible. The percentage frequency occurrence (%FO) of prey items were then calculated to identify key prey items (Amundsen *et al.*, 1996).

$$\mathbf{FO_i} = \left(\frac{\boldsymbol{N_i}}{\boldsymbol{N}}\right) * \mathbf{100}$$

Where:
$\mathbf{FO_i}$ is the percentage frequency of prey item i,
$\boldsymbol{N_i}$ is the number of fish with prey i in their stomach,
$\boldsymbol{N}$ is total number of fish with stomach contents.

2.3. Biosecurity - disinfection and decontamination procedures

Procedures are required for disinfection of equipment 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.

3. Results

3.1. Species Richness

Brown trout and European eel were the only fish species recorded during the survey on Lough Nasnahida in July 2021. A total of 140 fish were captured (Table 3.1).

Table 3.1. Number of each fish species captured by each gear type during the survey on Lough Nasnahida, July 2021

Scientific name	Common name	Number of fish captured			
		BM CEN	FM CEN	Fyke	Total
Salmo trutta	Brown trout	113	17	8	138
Anguilla anguilla	European eel	0	0	2	2

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. In 2021 brown trout was the dominant fish species in terms of both abundance and biomass (Table 3.2).

Table 3.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Nasnahida, 2021

Scientific name	Common name	Mean CPUE (± S.E)	Mean BPUE (± S.E)
Salmo trutta	Brown trout	0.447 (0.108)	23.099 (5.446)
*Anguilla anguilla**	European eel	0.017 (0.000)	2.500 (0.533)

Note: Where biomass data was unavailable for an individual fish, this was determined from a length/weight regression for that species (Connor *et al*. 2017). *Eel CPUE and BPUE based on fyke nets only.

CPUE and BPUE for each species captured in all surveys, per net type, between 2009 and 2021 are presented in Figures 3.1 and 3.2 respectively and illustrates fish community change over time. Brown trout stocks remained relatively stable across all sampling occasions (Figures 3.1 and 3.2).

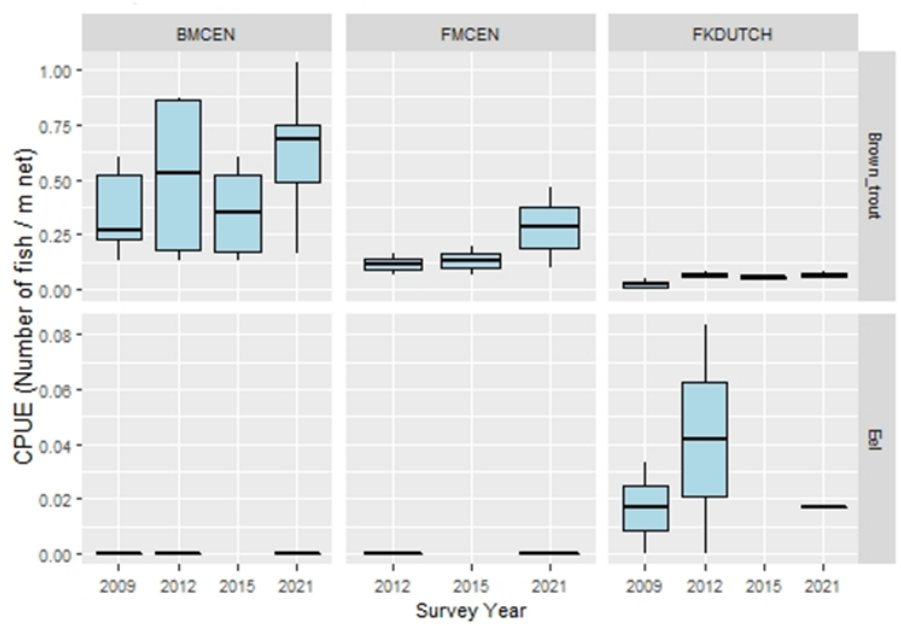

Figure 3.1. CPUE of all fish species captured in each net type during surveys of Lough Nasnahida between 2009 and 2021. Figures are expressed as mean number of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots. The y axis (CPUE) is unique for each species.

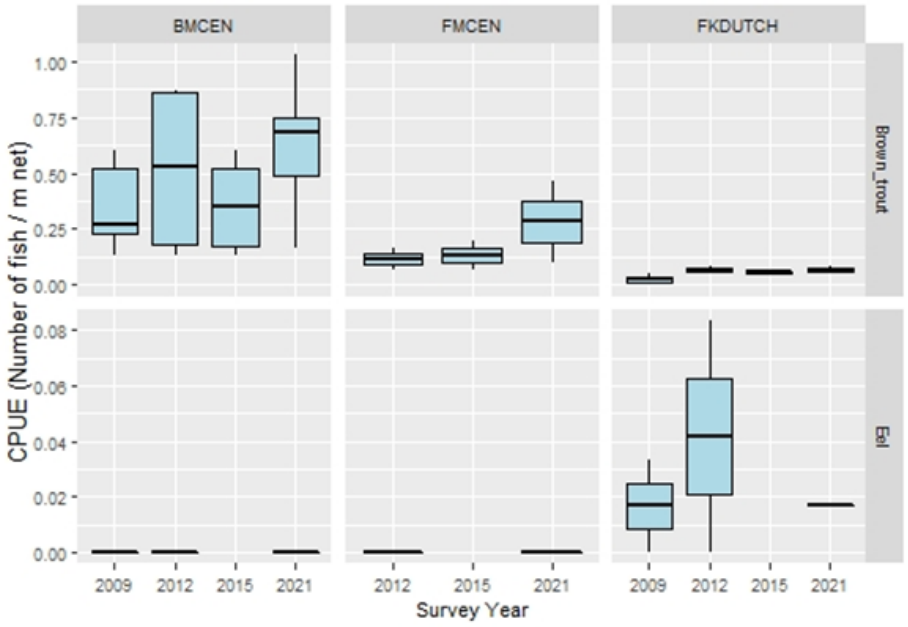

Figure 3.2. BPUE of all fish species captured in each net type during surveys of Lough Nasnahida between 2009 and 2021. Figures are expressed as mean biomass (g) of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots. The y axis (BPUE) is unique for each species.

3.3. Length frequency distributions and growth

Brown trout

Brown trout captured during the 2021 survey ranged in length from 6.2cm to 24.8cm (mean = 16.2cm). Lengths of brown trout captured were similar across surveys, with some smaller fish (0+) recorded in the 2012 and 2021 surveys (Figure 3.3). Four age classes were present in the sample aged, ranging from 0+ to 3+. The population was heavily dominated by 1+ and 2+ fish, which together accounted *c.* 90% of the sample aged (*.c* 11cm- 24cm Figure 3.3). Mean L1 (i.e. length at the end of the first year) was 7.1cm (Table 3.3). Mean brown trout L3 in 2021 was 20.2cm indicating a very slow rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971) (Table 3.3).

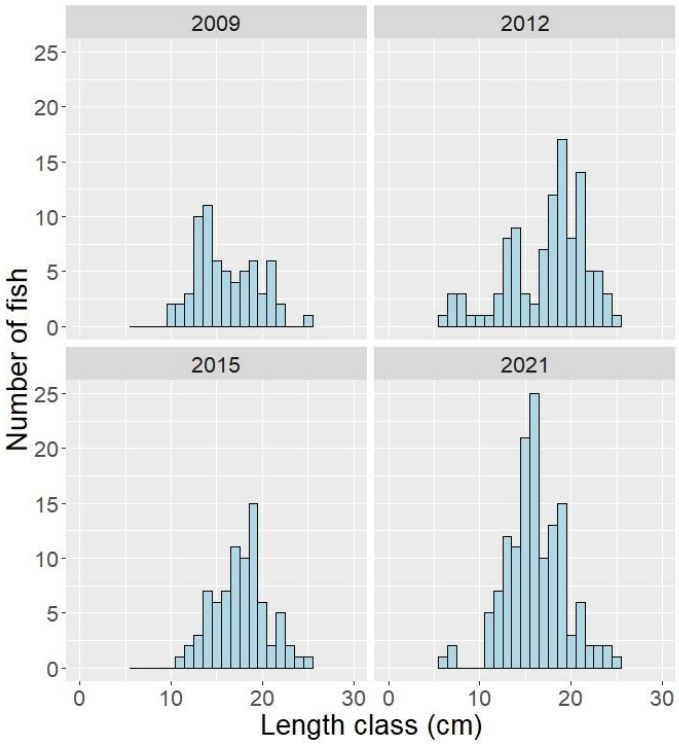

Figure 3.3. Length frequency of brown trout captured on Lough Nasnahida, 2021

Table 3.3. Mean (±S.E.) brown trout length (cm) at age for Lough Nasnahida, July 2021

	L_1	L_2	L_3
Mean (±S.E.)	7.1 (0.1)	14.1 (0.2)	20.2 (0.4)
N	65	37	5
Range	5.4-8.5	12.5-16.7	19.1-21.2

Plate 3.1. Brown trout from Lough Nasnahida, July 2021

Other Species

The two eels captured on Lough Nasnahida measured 40.0cm and 46.5cm.

3.4. Stomach and diet analysis

The dietary analysis conducted provides insight to the prey of examined fish immediately prior to capture. Longer term and seasonal studies provide a more robust assessment of fish diet. The stomach contents of a subsample of brown trout captured during the survey were examined and are presented below.

A total of 45 brown trout stomach contents were examined. Of these, 21 contained food items. Invertebrates were recorded in 16 (76%) stomachs. Five stomachs (24%) contained zooplankton (Figure 3.4).

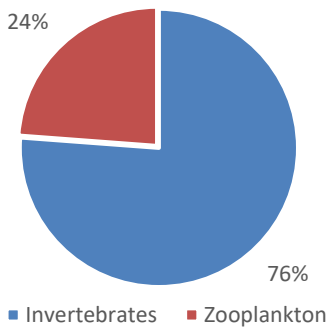

Figure 3.4. Diet of brown trout (n = 21) captured on Lough Nasnahida 2021 (% occurrence)

4. Summary and ecological status

Brown trout and eels are the only fish species recorded on all surveys of the lake conducted since 2009. Brown trout was the dominant species in terms of abundance (CPUE) and biomass (BPUE) captured in the survey gill nets during the 2021 survey. The population has remained relatively stable across all sampling occasions and was dominated by young (i.e. 1+ and 2+) brown trout, with few larger or older fish recorded. 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).

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 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 Nasnahida has been assigned an ecological status of Good for 2021 based on the fish populations present. In previous years (2009, 2012 and 2015) the lake was also assigned Good fish ecological status (Figure 4.1).

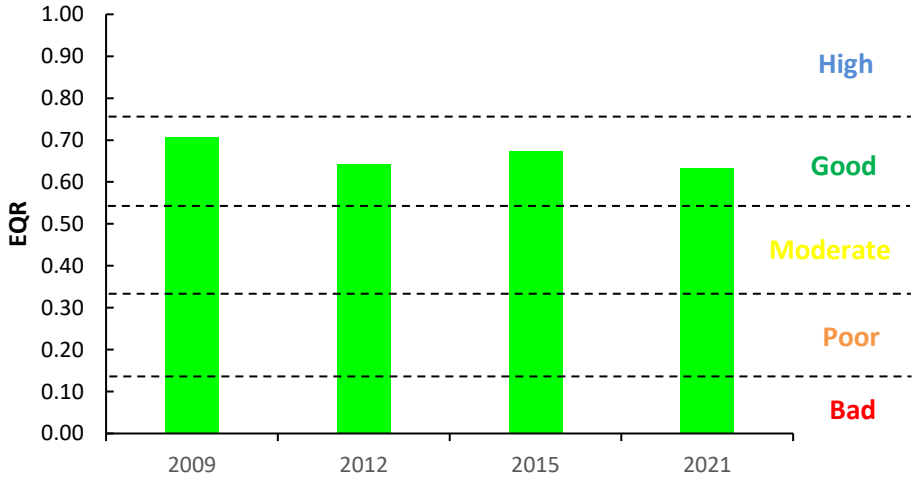

Figure 4.1. Fish ecological status of Lough Nasnahida, 2009, 2012, 2015 and 2021

In the 2013 to 2018 surveillance monitoring reporting period, the EPA assigned Lough Nasnahida an overall draft ecological status of Good, based on all monitored physico-chemical and biological elements, including fish. This status classification will be revised during 2022.

5. References

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