# Sampling Fish for the Water Framework Directive Summary Report

# 2021

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Inland Fisheries Ireland

National Research Survey Programme

Sampling Fish for the Water Framework Directive - Summary Report 2021

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### **Executive summary**

Inland Fisheries Ireland has been assigned the responsibility by the EPA of delivering the fish monitoring requirements of the Water Framework Directive (WFD) in Ireland. In 2021, 27 lake waterbodies, 294 river sites and five transitional waterbodies were surveyed as part of the national IFI fish monitoring programme.

All surveys were conducted using a suite of European standard methods, including a range of different net types to sample lakes and transitional waters and a range of electrofishing methods for sampling rivers.

A total of 14 species and two hybrid varieties were captured across the lake waterbodies surveyed in 2021. European eel had the widest distribution, with perch being the most abundant species. The FIL2 ecological classification tool was used together with expert opinion to assign fish ecological status to each lake waterbody surveyed. Five lake waterbodies were assigned a status of High; nine were assigned Good; five were assigned Moderate status; three waterbodies were assigned Poor and five were assigned Bad fish ecological status. All waterbodies had been surveyed previously and when compared to previous results, it was found that twenty-one lake waterbodies (77.8%) had an unchanged fish ecological status, four waterbodies (14.8%) showed an improvement in status, while the remaining two lakes (7.4%) showed a deterioration.

A total of 15 species and one hybrid variety were recorded across all river sites surveyed in 2021, with brown trout the most abundant species, occurring in 237 out of 294 sites. The FCS2-Ireland ecological fish classification tool was used together with expert opinion to assign ecological status to each river site. A total of 30 sites were classified as High status, 57 were classified as Good, 132 were classified as Moderate, 54 were classified as Poor and seven were classified as Bad. Fourteen sites were unclassified. Of the 280 sites assigned an ecological fish status in 2021, 119 sites had previously been surveyed and classified. Of these the status of 51 (42.9%) sites remained unchanged between surveys, while 34 (28.6%) sites deteriorated and 31 (26.1%) showed an improved status.

A total of 46 species of fish were captured in the four transitional waterbodies surveyed in 2021. Sand goby, thick-lipped mullet, European eel and three-spined stickleback were the most widely distributed species, occurring in all five waterbodies. The EMFI ecological classification tool, together with expert opinion was used to assign ecological status to each transitional water surveyed. Three transitional waterbodies were classified as Good status and two as Poor.



### **1. INTRODUCTION**

In December 2000, the European Union introduced the Water Framework Directive (WFD) (2000/60/EC) as part of a new standardised approach for all Member States to manage their water resources and to protect aquatic ecosystems. The WFD was transposed into Irish Law in December 2003 (Water Regulations S.I. No. 722 of 2003).

The fundamental objective of the WFD is to protect and maintain the status of waters that are already of good or high quality, to prevent any further deterioration and to restore all waters that are impaired so that they achieve at least good ecological status by 2027 and to ensure long term sustainable use.

Ireland is currently in its third cycle of its River Basin Management Plans (RBMPs). These RBMPs outline the approach governments will take to protect national waters. The first RBMP cycle ran from 2009-2014, the second cycle from 2015-2021 and the third cycle is running from 2022-2027.

A key step in the WFD process is for EU Member States to assess the health of their surface waters through national monitoring programmes. Classification tools are the main instruments used to classify the status (High, Good, Moderate, Poor or Bad) of each water body (section of a river or other surface water). Once each country has determined the status of their water bodies, ongoing monitoring helps to track the effectiveness of measures needed to restore water bodies and achieve good status. The responsibility for monitoring fish has been assigned to Inland Fisheries Ireland (IFI) by the EPA (EPA, 2006 and 2021). A national fish stock surveillance monitoring programme has been conducted since 2007 at specified locations. (e.g. Kelly *et al.*, 2015, Corcoran *et al.*, 2021). The monitoring programme encompasses lakes, rivers and transitional waters (estuaries and lagoons) and provides information on the status of fish species present in these water bodies as well as on their abundance, growth patterns, and population demographics. During 2021 the river fish monitoring programme was updated to follow an index catchment approach that will provide a more comprehensive overview of the health of fish stocks in each catchment for both IFI, the EPA and other stakeholders (Matson *et al.*, 2022). For transitional waters the programme will be similarly updated to rationalise monitoring activity and to include waterbodies with substantive deterioration in status.

Despite the COVID-19 pandemic and the resulting restrictions and lockdowns, the WFD fish surveillance monitoring programme in 2021 was successful in targeting selected waterbodies; 22 lake waterbodies, 26 river sites (plus 53 additional sites in surveillance waterbodies) and five transitional water bodies were surveyed nationwide. An additional five lake waterbodies and 215 river sites were surveyed as part of a new national index catchment monitoring approach to fish monitoring and to support WFD, and other IFI projects and programmes. All necessary measures and precautions were



taken to ensure the health and safety of staff, with several risk assessments carried out and standard operating procedures drawn up prior to commencement. A team of IFI staff carried out the monitoring surveys (scientists from the Research Division) in collaboration with colleagues from each IFI River Basin District. The surveys were conducted using a suite of European standard methods; electric fishing is the main survey method used in rivers, with various netting techniques used in both lakes and estuaries. Field survey work was conducted from June to October, which is the optimum time for sampling fish in Ireland.

This report summarises the main findings of the fish stock surveys in all water bodies (lakes, rivers and transitional waters) surveyed in 2021 and reports the current ecological status of the fish stocks in each (where available).

Detailed reports on all water bodies surveyed are available to download on the dedicated WFD fish website (www.wfdfish.ie).



Plate 1.1 Lough Corrib, Co. Galway (WRBD) surveyed in 2021 as part of the WFD fish surveillance monitoring programme.



# 2. STUDY AREA

Inland Fisheries Ireland is organised into six River Basin Districts (RBDs); Eastern ERBD), South-Eastern (SERBD), South-Western (SWRBD), Western (WRBD), Shannon (SHRBD) and the North-Western (NWRBD). Fish surveys were carried out in all six RBDs during 2021 (Fig. 2.1). For ease of navigation through the report the results are presented as surveillance monitoring (SM) or additional value (AV) sites (Fig. 2.1). Additional value sites were surveyed to provide a more comprehensive overview of fish ecological status in each waterbody or catchment and to support other projects and programmes.

# 2.1 Lakes

Twenty-seven lake waterbodies were surveyed between the 14<sup>th</sup> of June and the 29<sup>th</sup> of September 2021. Seven lake waterbodies were in the NWRBD, nine in the WRBD, seven in the SHRBD, two in the SWRBD and two in the ERBD (Fig. 2.1). In total, 22 of the lake waterbodies surveyed were surveillance monitoring waterbodies (SM). These SM waterbodies are normally surveyed on a three-year rolling cycle as part of the WFD programme, but there are some exceptions to this rule that have been agreed with the Environmental Protection Agency (Table 4.2, Fig. 2.1).

Four additional lakes were surveyed as part of IFI's ongoing effectiveness monitoring programme for the Owenriff Fish Population Rehabilitation Plan (IFI, 2018). One lake, Lattone Lough, dropped from the original SM programme, was surveyed as part of IFI's general lake survey programme in collaboration with staff from the Agri-Food and BioSciences Institute Northern Ireland (AFBINI). These five lakes are presented as additional value (AV) sites (Table 4.2, Fig. 2.1).

# 2.2 Rivers

A total of 294 river sites were surveyed between the 1<sup>st</sup> of July and the 29<sup>th</sup> of September 2021. 251 sites were wadeable and 43 were non-wadeable, requiring boats for electrofishing. A total of 56 (54 wadeable and two boat sites) sites were surveyed in the SWRBD; 116 (84 wadeable and 32 boat sites) sites in the SERBD; five wadeable sites were surveyed in the ERBD; 12 wadeable sites were surveyed in the NWRBD; 45 wadeable sites in the WRBD and 60 sites (51 wadeable and 9 boat sites) were surveyed in the SHRBD. Of these sites 27 sites (16 wadeable and 11 boat) were surveillance monitoring sites (SM). The remaining 267 sites were additional value sites (AV). Of these AV sites, 53 sites were located within surveillance monitoring waterbodies. These AV sites were surveyed to give a more comprehensive overview of the health of fish stocks in each catchment (Table 4.4 and Fig. 2.1).



# 2.3 Transitional waters

Five transitional water bodies were surveyed between the 13<sup>th</sup> of September and the 13<sup>th</sup> of October 2021. Three of the transitional water bodies were in the SHRBD, including two within The Shannon Estuary. Due to adverse weather conditions, it was not possible to complete surveys on the remaining Shannon Estuary waterbodies. Two waterbodies in the SWRBD were also successfully surveyed in 2021. All five waterbodies surveyed were surveillance monitoring (SM) sites (Table 4.5 and Fig. 2.1).



Plate 2.1 Aerial view of a section of Limerick Docks waterbody on the Shannon Estuary (Photo courtesy of IFI and No. 3 Operational Wing, Irish Air Corps (Aer Chór na hÉireann)).



Plate 2.2 Aerial view of Lough Gill in the SHRBD (Photo courtesy of IFI and No. 3 Operational Wing, Irish Air Corps (Aer Chór na hÉireann)).





Fig. 2.1. Location of WFD fish surveillance monitoring (SM) and additional value (AV) surveys carried out on lakes, rivers and transitional waters (TW) from June to October 2021.



# 3. METHODS

All surveys were conducted using a suite of European standard methods (CEN, 2003; CEN, 2005a; CEN, 2015) and IFI standard operating protocols. Electrofishing is the main survey method used in rivers, while a multi-method netting approach is used in both lakes and transitional waters.

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 in IFI when moving between water bodies.

### 3.1 Lakes

Lake water bodies were surveyed using a netting method developed and tested during the Interreg IIIA funded NSSHARE Fish in Lakes Project 2005-2006 (Kelly *et al.*, 2007a and 2008) and updated during a more recent method intercalibration exercise (Connor *et al.*, 2017). The method is based on the European CEN standard for sampling fish with multi-mesh monofilament survey gill nets (12 panel, 5-55mm mesh size) using a stratified random sampling design (CEN, 2015). However, the netting effort has been reduced (approximately 50%) for Irish lakes to minimise damage to fish stocks. Each lake is divided into depth strata (0-2.9m, 3-5.9m, 6-11.9m, 12-19.9m, 20-34.9m, 35-49.9m, 50-75m, >75m) and random sampling is conducted within each layer (CEN, 2015). Surface floating multi-mesh monofilament survey gill nets, fyke nets (one unit comprised of three fyke nets; leader size 8m x 0.5m) and large mesh (55mm, 60mm, 70mm and 90mm) multifilament braided survey gill nets are also used to supplement the CEN standard gill netting effort.

All fish apart from perch were measured and weighed on site and scales were removed from all brown trout, salmon, pike and cyprinids. These scales are used to age fish and generate growth rates. 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 abundance (mean CPUE) and biomass (mean BPUE) was calculated for each lake. Fish abundance and biomass was expressed as the mean number/weight of fish captured per metre of net (all nets) for all fish species except eels. Eel CPUE/BPUE was based on catches in fyke nets only.

In the laboratory stomach contents and sex were recorded for trout, salmon, perch and pike. Sex was recorded for cyprinid species. Perch had their operculum removed in the lab. These opercula were used to age perch and generate growth rates.





Plate 3.1. Preparing survey nets on Lough Corrib in the WRBD.



Plate 3.2 Processing fish samples on Lough Melvin, NWRBD



# 3.2 Rivers

Electrofishing is the method of choice to obtain a representative sample of the fish assemblage in rivers. It is a well-established technique used by fishery biologists globally for sampling fish and is generally the most non-destructive, effective and cost-efficient means of sampling. This technique complies with European Committee for Standardisation (CEN) guidelines for fish stock assessment in rivers (CEN, 2003). In 2021 electrofishing methods used were: area delineated depletion electrofishing (ADEF) (wadeable and non-wadeable sites), qualitative timed (ten minute) electrofishing (TEF<sub>10</sub>) (wadeable sites) and systematic point abundance sampling (sPASE) using boom boat electrofishing equipment.

# ADEF (wadeable sites)

ADEF electrofishing is the primary method used to sample surveillance monitoring sites (SM). A wadable electrofishing set consists of one portable generator (220/240V) or electrofishing backpack with an appropriate control unit (DC converter), a cathode and an anode. The number of electrofishing units used on each site is determined by the width of the site and varies between one and three sets. ADEF fishing involves between two and more operators depending on the number of electrofishing sets used. Fishing is carried out by walking steadily in a straight line, in an upstream direction, ensuring the electrical field covers the entire width of the river. A representative sample of all habitats present is sampled (i.e. riffle, glide, pool). At each site the stretch was isolated, where possible, using stop nets and one to three fishings carried out. Fish from each fishing occasion were sorted and processed separately.

### ADEF (non-wadeable sites)

ADEF boat-based electrofishing is conducted on larger, deeper non-wadeable channels (>0.5-1.5m). Typically, boat-based electrofishing is carried out on a stretch of river from a flat-bottomed boat(s) in a downstream direction using a generator, control box, a pair of anodes and a cathode. The width of the channel determines how many boats should be used to sufficiently sample the site. Where a river is too wide for the number of boats or resources available, a partial survey may be undertaken along one bank only.

### Ten-minute timed electrofishing (TEF<sub>10</sub>) (wadeable sites)

The TEF<sub>10</sub> electric-fishing method is a qualitative procedure that supplements the ADEF method during catchment wide surveys (Matson *et al.*, 2018). TEF<sub>10</sub> fishing generally involves two operators and is used to sample added value sites (AV). This method is generally quicker than ADEF fishing and allows



for a broader catchment analysis. The equipment consists of one portable generator (220/240V) or electrofishing backpack with an appropriate control unit (DC converter), a cathode and an anode. TEF10 electrofishing takes place by wading in a zigzag manner in an upstream direction for exactly ten minutes at a steady pace (Matson *et al.*, 2018).

### Systematic point abundance sampling (Boat based) (sPASE)

On larger, navigable rivers where sites cannot be surveyed effectively using the above methods, such as the River Barrow, a specialised electrofishing boom boat is used. The boom boat involves moving upstream collecting fish at numerous evenly distributed point samples (20m apart) along the right or left bank over the entire study site or reach in fishable zones. Upon arrival at each sampling point, the power was turned on for 10 seconds. If fish were present, the power was kept on until all fish at the anodes were captured. If no fish were present the power was turned off after 10 seconds.

For all the above methods, fish were held in a large bin or live well of oxygenated water until processing was complete. Fish were identified, counted and measured on site. A sub-sample of scales was taken from selected species for age analysis and growth rate calculation in the laboratory. When fully recovered, fish were returned to the water. A subsample of fish from selected sites were retained for later priority substance analyses.

An evaluation of habitat quality is critical to any assessment of ecological integrity. A simple habitat assessment described by Kelly *et al.* (2015b) was conducted at each site. General physical characteristics of the site were recorded, with reference made to river typology, land use, river pressures, riparian and bank vegetation and instream features such as habitat type, flow type, and substrate type. Wetted width and depth were measured at five transects at each site, with five depth intervals across each transect. Chemical parameters recorded included water temperature (°C) and conductivity ( $\mu$ S/cm).

Following on from each survey, fish abundance was calculated for each site. Fish abundance was expressed as minimum fish population density, this was calculated as the mean number of fish captured per metre squared.

### 3.3 Transitional waters

Transitional waters (estuaries/lagoons) are an interface habitat, where freshwater flows from rivers and mixes with the tide and salinity of the sea. As such, they provide a challenging habitat to survey due to their constantly changing environmental conditions. In every 24-hour period, the tidal level rises and falls twice, subjecting extensive areas to inundation and exposure.



Wightman *et al.* (2021), describes the multi-method approach, including the use of beach-seine netting, beam trawling and setting fykes nets, utilised by IFI staff to survey transitional waters in 2021. A modified beach-seine net was used in 2021 to increase efficiency and to ensure compliance with COVID-19 restricted working conditions (Wightman *et al.*, 2021).

Fish samples from all nets were processed on site by identifying the fish species present and counting the total numbers caught in each. Length measurements were recorded on a sub-sample of species, while scales were collected from certain species such as salmon and sea trout. Unidentified specimens were retained for subsequent identification in the laboratory. Chemical parameters such as water temperature (°C), conductivity ( $\mu$ S/cm) and salinity (PPT) were recorded at each netting location.



Plate 3.3. Electrofishing on the Kerry Blackwater, Co. Kerry in the SWRBD.



# 3.4 Fish ecological status

An essential step in the WFD monitoring process is the classification of the ecological status of fish in lakes, rivers and transitional waters. This data informs the objectives that must be set in the individual River Basin Management Plans (RBMPs).

Three fish ecological classification tools have been developed to assign status to fish stocks in Irish lakes, rivers and transitional waters for WFD purposes. The Fish in Lakes (FIL2) ecological classification tool was used to assign ecological status to lakes surveyed in 2021 (Kelly *et al.*, 2012). An ecological classification tool for fish in rivers (Fisheries Classification Scheme 2 (FCS2-Ireland)) was developed in 2011 to assign ecological status to fish in rivers for the Republic of Ireland and Northern Ireland (SNIFFER, 2011). The Estuarine Multi-Metric Fish Index (EMFI) developed in 2013, was used to assign fish ecological status to transitional water bodies (Harrison and Kelly, 2013).



Plate 3.4. Electrofishing boom boat on the River Barrow in the SERBD.



# 4. RESULTS

### 4.1 Lakes

# 4.1.1 Fish species distribution and abundance

A total of 14 fish species (sea trout are included as a separate "variety" of trout) and two cyprinid hybrid varieties were recorded across the 27 lake waterbodies surveyed during 2021 (Table 4.1). European eel had the widest distribution, occurring in 22 lakes, followed by pike and brown trout (Table 4.1).

	Scientific name	Common name	Number of lakes	% of lakes
1	Anguilla anguilla	European eel	22	81.5
2	Esox lucius	Pike	18	66.6
3	Salmo trutta	Brown trout	16	59.3
4	Perca fluviatilis	Perch	16	59.3
5	Scardinius erythrophthalmus	Rudd	11	40.7
6	Rutilus	Roach	10	37.9
7	Rutilus X Abramis brama	Roach X bream hybrid	8	29.6
8	Gasterosteus aculeatus	Three-spined stickleback	6	22.2
9	Tinca tinca	Tench	6	22.2
10	Salmo salar	Atlantic salmon	5	18.5
11	Abramis brama	Bream	5	18.5
12	Salvelinus alpinus	Arctic char	4	14.8
13	Phoxinus phoxinus	Minnow	2	7.4
14	Platichthys flesus	Flounder	2	7.4
15	Salmo trutta	Sea trout*	1	3.7
16	Alosa killarnensis	Killarney shad	1	3.7
17	Scardinius erythrophthalmus X Rutilus	Rudd X roach hybrid	1	3.7

# Table 4.1. Fish species recorded in lake waterbodies surveyed in 2021

*Note: \*sea trout are included as a separate "variety" of trout.* 

The distribution and abundance of the most common fish species captured amongst all lakes surveyed in 2021 is shown in Figures 4.5 to 4.17. Species abundance was recorded as Catch-Per-Unit-Effort (CPUE). In addition to the species displayed in the figures, flounder were captured on Lough Aughrusbeg and Lough Leane, sea trout were recorded on Dunglow Lough, Killarney shad were captured on Lough Leane and rudd X roach hybrids were captured on Lough Melvin.



Perch were the most abundant species captured during the 2021 survey season. The highest CPUE recorded for perch was in Lough Muckno, with a value of 1.795 fish/m of net (Fig 4.9).

Brown trout were the next most abundant species and were the dominant species in five of the 27 lakes surveyed. The highest CPUE recorded for brown trout was in Lough Nasnahida, with a value of 0.447 fish/m of net (Fig 4.5).

Roach were the dominant species in three lakes, while pike, eels and three-spined stickleback were the dominant species in two lakes respectively and rudd were the dominant species in one lake.

# 4.1.2 Ecological status - Classification of lakes using 'FIL2'

All 27 lake waterbodies surveyed in 2021 were assigned a draft fish ecological status class using the FIL2 ecological classification tool, together with expert opinion. Five were classified as having High ecological status, nine as Good, five as Moderate, three as Poor and five as Bad (Table 4.2, Figure 4.1).

Of the 27 lake waterbodies surveyed in 2020, all had previously been sampled and assigned a fish ecological status. Twenty-one lake waterbodies (77.8%) had an unchanged fish ecological status, four waterbodies (14.8%) showed an improvement in status, while the remaining two lakes (7.4%) showed a deterioration (Table 4.2).



Plate 4.1. Retrieving a net on Lough Gur in the SHRBD.



Table 4.2 Summary details and fish ecological status of lakes surveyed for the WFD fish in lakessurveillance monitoring programme 2021.

Lake waterbody	WFD Code	Survey type	Catchment	FIL2 Typology	Area (ha)	Previous Status	2021 status
			SWRBD				
Leane	SW_22_210	SM	Laune	2	1944.3	G (2017)	Good
Upper Lake	SW_22_186	SM	Laune	2	166.7	M (2014)	Mod
			NWRBD				
Lattone	NW_35_143	SM	Drowes	1	32.8	B (2013)	Poor
Melvin	NW_35_160	SM	Drowes	2	2197.0	G (2017)	Good
Dunglow	NW_38_692	SM	Coastal	1	65.1	H (2015)	High
Kiltooris	NW_38_47	SM	Coastal	1	43.3	H (2014)	Good
Kindrum	NW_38_670	SM	Coastal	3	60.8	M (2015)	Mod
Nasnahida	NW_38_67	SM	Owenamarve	1	15.2	G (2015)	Good
Sessiagh	NW_38_61	SM	Coastal	2	24.1	H (2015)	High
			SHRBD				
Gur	SH_24_99	SM	Shannon	3	78.9	M (2018)	Mod
Alewnaghta	SH_25_189	SM	Shannon	3	54.6	B (2015)	Bad
Sheelin	SH_26_709	SM	Inny	3	1808.2	G (2017)	Good
Urluar	SH_26_689	SM	Shannon	3	114.9	B (2013)	Mod
Atedaun	SH_27_108	SM	Fergus	3	37.9	G (2013)	Poor
Cullaun	SH_27_115	SM	Fergus	4	49.7	H (2015)	High
Dromore	SH_27_82	SM	Fergus	4	49.1	H (2015)	High
			WRBD				
Bunny	WE_27_114	SM	Kinvara	3	102.9	G (2015)	Good
Adrehid	WE_30_215	AV	Corrib	1	7.5	B (2018)	Bad
Ateeann	WE_30_235	AV	Corrib	1	3.8	B (2018)	Bad
Loughaphreaghaun	WE_30_346	AV	Corrib	1	65.0	B (2018)	Bad
Shanaghree	WE_30_307	AV	Corrib	1	4.3	B (2018)	Bad
Corrib Lower	WE_30_666a	SM	Corrib	3	5062.8	G (2018)	Good
Corrib Upper	WE_30_666b	SM	Corrib	4	11568. 3	G (2018)	Good
Aughrusbeg	WE_32_436	SM	Coastal	1	50.2	P (2013)	Poor
Templehouse	WE_35_157	SM	Ballysadare	3	118.6	B (2014)	Good
			ERBD				
Muckno	IE_NB_06_56	SM	Fane	4	355.9	P (2015)	Mod
Dan	IE_EA_10_29	SM	Avoca	2	102.9	H (2015)	High





Fig. 4.1. Fish ecological status of lakes surveyed during 2021. Status was assigned using the FIL2 ecological classification tool.



# 4.1.3 Ecological status – Summary of 2019-2021.

A total of 54 lakes were surveyed to assess the status of their fish populations between 2019 and 2021 (Fig. 4.4). Of these lakes 64.8% were assigned a status of High or Good. The remaining 35.2% of lakes failed to meet the required standard of at least Good status (Fig.4.2).



# Fig. 4.2. Fish ecological status of lake waterbodies surveyed during between 2019-2021. Status was assigned using the FIL2 ecological classification tool.

A total of 47 lakes had previously been assigned a fish ecological status. Of these lakes 68.1% remained unchanged compared to previous surveys. There was an improved fish ecological status observed on 17.0% of lakes, while 14.9% of lakes deteriorated (Fig. 4.3)



### Fig. 4.3. Fish ecological status trends between 2019-2021 in Irish lake waterbodies.





Fig. 4.4. Fish ecological status of lake waterbodies surveyed between 2019-2021. Status was assigned using the FIL2 ecological classification tool.



# 4.2 Rivers

# 4.2.1 Fish species distribution and abundance

A total of 15 fish species (sea trout are included as a separate "variety" of trout) and one cyprinid hybrid were recorded across the river sites surveyed in 2021 (Table 4.3). Brown trout had the widest distribution, occurring in 237 out of the 294 sites surveyed, followed by salmon and European eel (Table 4.3).

	Scientific name	Common name	Number of river sites	% River sites
1	Salmo trutta	Brown trout (all age classes)	237	80.6
		Brown trout 0+	207	70.4
		Brown trout 1+ and older	199	67.7
2	Salmo salar	Salmon (all age classes)	138	46.9
		Salmon 0+	116	39.5
		Salmon 1+ and older	103	35.0
3	Anguilla	European eel	73	24.8
4	Esox lucius	Pike	17	5.8
5	Perca fluviatillis	Perch	20	6.8
6	Phoxinus	Minnow	77	26.2
7	Gasterosteus aculeatus	Three-spined stickleback	86	29.3
8	Barbatula barbatula	Stone loach	61	20.7
9	Lampetra sp.	Lamprey sp.	26	8.8
10	Leuciscus	Dace	29	9.9
11	Rutilus	Roach	27	9.2
12	Gobio	Gudgeon	12	4.1
13	Pungitius pungitius	Nine-spined stickleback	4	1.4
14	Platichthys flesus	Flounder	2	0.7
15	Abramis brama X Rutilus	Roach X bream hybrid	2	0.7
16	Salmo trutta	Sea trout*	1	0.3
17	Abramis brama	Bream	1	0.3

# Table 4.3. Fish species recorded in river sites surveyed in 2021. Age cohorts for brown trout andsalmon are also shown.

*Note: \*sea trout are included as a separate "variety" of trout.* 

The distribution and abundance of the most common fish species captured amongst all river sites surveyed in 2021 is shown in Figures 4.5 to 4.14 and 4.18 to 4.21. Abundance was recorded as minimum fish population density, the number of fish per m<sup>2</sup> of surface area sampled at the site.



Brown trout was the most abundant species recorded at 237 sites in 2021 (Fig. 4.5). The Benamore Bridge site on the Bunow River (Little Brosna catchment), in the SHRBD, had the highest total density recorded with 1.64 fish/m<sup>2</sup>. This site also recorded the highest density of 1+ and older brown trout fry (1.12 fish/m<sup>2</sup>). Brabstown on the Arrigle River (a tributary of the River Nore) in the SERBD, had the highest density of 0+ brown trout (1.34 fish/m<sup>2</sup>).

Salmon were widely distributed occurring at 138 sites (Fig 4.6). The highest density of salmon, 1.58 fish/m<sup>2</sup>, was recorded at Philip's Bridge on the Coolcullen River (Nore/Dinin catchment) in the SERBD. The highest density of salmon fry (0+) (1.51 fish/m<sup>2</sup>) was also recorded at the Philip's Bridge site. The Clooshgereen Track site on the Clooshgereen River (Owenriff catchment), in the WRBD had the highest density (0.21 fish/m<sup>2</sup>) of salmon parr.

European eels were captured at 73 sites (Fig 4.7). The highest eel density, 0.23 fish/m<sup>2</sup>, was recorded at Arena\_7 site on the Swilly River, in the NWRBD.

Pike were captured at 17 sites (Fig 4.8). The highest density of pike, 0.03 fish/m<sup>2</sup>, was recorded at Levitstown canal bridge site on the River Barrow in the SERBD.

Perch were captured at 20 sites (Fig 4.9). The Dunleckny site on the River Barrow, in the SERBD had the highest density of perch, 0.26 fish/m<sup>2</sup>.

Minnow were present at 77 sites surveyed in 2021 (Fig 4.11). The highest density of minnow, 0.63  $fish/m^2$  was found at Coneyburrow bridge on the White (Louth) River in the ERBD.

Three-spined stickleback were widely distributed occurring at 86 sites in 2021 (Fig 4.12). Nine-spined stickleback were captured at four sites in 2021. Derrymore on the Nore River in the SERBD had the highest density of both stickleback species (three-spined stickleback at 2.79 fish/m<sup>2</sup> and nine-spined stickleback at 0.11 fish/m<sup>2</sup>).

Stone loach were recorded at 61 sites in 2021 (Fig 4.18). The highest density of stone loach, 1.23 fish/m<sup>2</sup> was recorded at Benamore Bridge site on the Bunow River (a tributary of the Little Brosna), in the SHRBD.

Lamprey were captured at 26 sites in 2021 (Fig 4.19). The highest lamprey sp. density, 0.08 fish/m<sup>2</sup>, was recorded at Brabstown on the Arrigle River (Nore catchment) in the SERBD.

Dace were recorded at 29 sites, all within the SERBD in 2021 (Fig. 4.20). The highest density of dace  $0.83 \text{ fish/m}^2$ , was observed at Bagenalstown on the River Barrow in the SERBD.



Roach were recorded at 27 sites in 2021 (Fig. 4.10). The highest density of roach 0.70 fish/m<sup>2</sup>, was also found in the SERBD at Bagenalstown on the River Barrow.

Gudgeon were captured in low numbers at 12 sites in 2021 (Fig. 4.21). The highest density (0.004  $fish/m^2$ ) was captured at Bridge west of Lisnabo on the Camlin River in the SHRBD.

In addition to the above data, flounder were captured at two sites in 2021, a single sea trout was captured at one site and nine-spined stickleback were recorded at four sites.





Fig. 4.5. Brown trout distribution and abundance in lakes (CPUE (No. fish/m net)) and rivers (Density (No. fish/m<sup>2</sup>)) surveyed for WFD fish monitoring during 2021. (Note CPUE and density are not comparable).





Fig. 4.6. Atlantic salmon distribution and abundance in lakes (CPUE (No. fish/m net)) and rivers (Density (No. fish/m<sup>2</sup>)) surveyed for WFD fish monitoring during 2021. (Note CPUE and density are not comparable).





Fig. 4.7. European eel distribution and abundance in lakes (CPUE (No. fish/m net)) and rivers (Density (No. fish/m<sup>2</sup>)) surveyed for WFD fish monitoring during 2021. (Note – CPUE and density are not comparable).





Fig. 4.8. Pike distribution and abundance in lakes (CPUE (No. fish/m net)) and rivers (Density (No. fish/m<sup>2</sup>)) surveyed for WFD fish monitoring during 2021. (Note CPUE and density are not comparable).





Fig. 4.9. Perch distribution and abundance in lakes (CPUE (No. fish/m net)) and rivers (Density (No. fish/m<sup>2</sup>)) surveyed for WFD fish monitoring during 2021. (Note CPUE and density are not comparable).





Fig. 4.10. Roach distribution and abundance in lakes (CPUE (No. fish/m net)) and rivers (Density (No. fish/m<sup>2</sup>)) surveyed for WFD fish monitoring during 2021. (Note CPUE and density are not comparable).





Fig. 4.11. Minnow distribution and abundance in lakes (CPUE (No. fish/m net)) and rivers (Density (No. fish/m<sup>2</sup>)) surveyed for WFD fish monitoring during 2021. (Note CPUE and density are not comparable).





Fig. 4.12. Three-spined stickleback distribution and abundance in lakes (CPUE (No. fish/m net)) and rivers (Density (No. fish/m<sup>2</sup>)) surveyed for WFD fish monitoring during 2021. Note CPUE and density are not comparable.





Fig. 4.13 Bream distribution and abundance in lakes (CPUE (No. fish/m net)) and rivers (Density (No. fish/m<sup>2</sup>)) surveyed for WFD fish monitoring during 2021. Note CPUE and density are not comparable.





Fig. 4.14 Roach X bream hybrid distribution and abundance in lakes (CPUE (No. fish/m net)) and rivers (Density (No. fish/m<sup>2</sup>)) surveyed for WFD fish monitoring during 2021. Note CPUE and density are not comparable.





Fig. 4.15. Arctic char distribution in lakes surveyed for WFD fish monitoring during 2021.





Fig. 4.16 Distribution and abundance of rudd (CPUE (No. fish/m net)) in lakes surveyed for WFD fish monitoring during 2021.





Fig. 4.17 Distribution and abundance of tench (CPUE (No. fish/m net)) in lakes surveyed for WFD fish monitoring during 2021.





Fig. 4.18 Distribution and abundance of stone loach (Density (No. fish/m<sup>2</sup>)) at river sites surveyed for WFD fish monitoring during 2021.





Fig. 4.19 Distribution and abundance of lamprey sp. (Density (No. fish/m<sup>2</sup>)) at river sites surveyed for WFD fish monitoring during 2021.





Fig. 4.20 Distribution and abundance of dace (Density (No. fish/m<sup>2</sup>)) at river sites surveyed for WFD fish monitoring during 2021.





Fig. 4.21 Distribution and abundance of gudgeon (Density (No. fish/m<sup>2</sup>)) at river sites surveyed for WFD fish monitoring during 2021.



# 4.2.2 Fish Ecological status – Classification of rivers using 'FCS2 Ireland'

The FCS2-Ireland ecological classification tool was applied to all 294 river sites surveyed in 2021. The results were then sense checked using available data and expert opinion. In total 280 sites were assigned a fish ecological status, while 14 sites were left unassigned.

A total of 27 sites surveyed were surveillance monitoring sites (SM). In total, 25 SM sites were assigned a fish ecological status and two sites were left unassigned. Of the 25 sites classified, one was assigned High status (4.0%), five (20.0%) as Good, 13 (52.0%) Moderate and six (24.0%) Poor. No surveillance river sites were classified as Bad (Table 4.4; Fig. 4.22).

A total of 267 sites were surveyed as additional value sites (AV) (including 53 sites located within SM waterbodies). Of these, 255 sites were assigned a fish ecological status and 12 sites were left unassigned. Of the sites classified, 29 (11.4%) were classified as High status, 52 (20.4%) as Good, 119 (46.6%) as Moderate, 48 (18.8%) as Poor and seven as Bad (2.8%) (Table 4.4; Fig. 4.22).

Fifty-three AV sites were located within a surveillance monitoring waterbody (AV/WB). Of these, 50 sites were assigned status., four (8%) were classified as High status, 13 (26%) as Good, 19 (38%) as Moderate, 11 (22%) as Poor and two (4%) as Bad (Table 4.4).

Of the 280 sites assigned an ecological fish status in 2021, 119 sites had previously been surveyed and classified. Of these the status of 51 (42.9%) sites remained unchanged between surveys, while 34 (28.6%) sites deteriorated and 31 (26.1%) showed an improved status.



			Survey	Water body	Previous	2021
River	Sub-catchment	Site name	type	ID	status	Status
Argideen	Ihernagh	Kilmeen Track	AV	SW 20 687	_	Good
, agracen	Ihernagh	Rossmore Southwest	AV	SW 20 687	_	Good
	Lisroe	Mid Lyre	AV	SW 20 2251	_	Moderate
	Owenkeagh	Ballinascarty Br.	AV	SW 20 1799	-	High
	Owenkeagh	Dromgarriff North	AV	SW 20 1799	-	Moderate
	Owenkeagh	Kilmovlerane Track	AV	SW 20 1799	-	Good
	Owenkeagh	Monteen Castle	AV	SW 20 1799	-	Moderate
	Owenkeagh	Monteen Southwest	AV	SW 20 1799	-	Moderate
	Owenkeagh	Tullymurrihy	AV	SW 20 1799	-	Moderate
	Argideen	Argideen Br.	AV	SW 20 2122	-	Moderate
	Argideen	Gearagh Br.	AV	SW 20 2122	-	Good
	Argideen	Glanbrack Southeast	AV	SW 20 2122	-	Good
Bandon	Bandon	Br. Nr Desert Station	SM	SW 20 2230	M (2009)	Good
	Bandon	d/s Murragh Br.	AV	SW 20 2230	-	Good
	Bandon	Farnanes Br.	AV	SW 20 2101	G (2019)	High
	Ballymahan	Tullvglen North	AV	SW 20 1498	-	Good
	Ballynacarriga	Ballingurteen	AV	SW 20 753	G (2019)	Good
	Ballynacarriga	Monaneurig Bog	AV	 SW 20 753	H (2019)	High
	Bealanscartane	Bealanscartane Br.	AV	 SW 20 1534	M (2019)	High
	Bealanscartane	Drinagh East	AV	 SW 20 1534	P (2019)	Moderate
	Blackwater	Ahakeera	AV	 SW 20 770	M (2019)	Moderate
	Brewery	Cloonties	AV	SW 20 790	M (2019)	Moderate
	Brewery	Tonafora	AV	SW 20 790	H (2019)	High
	Bridewell	Meelon Br.	AV	SW 20 2011	G (2019)	High
	Bridewell	Service Station	AV	 SW 20 2011	M (2019)	High
	Brinny	Ballygarvey Br.	AV	 SW 20 1498	H (2019)	High
	Caha	Coolmountain Br.	AV	SW_20_1491	G (2019)	Moderate
	Caha	Poulnaberry Br.	AV	SW_20_1491	G (2019)	Moderate
	Cashel More	Gaggan Br.	AV	SW_20_1587	G (2019)	High
	Coom	Coorycullane	AV	SW_20_1320	M (2019)	Moderate
	Coom	Darkwood	AV	SW_20_1320	M (2019)	Moderate
	Cummernamart	Cummernamart	AV	SW_20_250	H (2019)	Moderate
	Curraghnacarton	Palaceanne North	AV/SM	SW_20_2108	Н (2019)	High
	Derragh	Keenrath	AV	SW_20_2115	G (2019)	High
	Derragh	Shanacrane	AV	SW_20_2115	G (2019)	Good
	Derrymeeleen	Roseville Br.	AV/SM	SW_20_1344	G (2019)	High
	Enniskean	Castleland	AV/SM	SW_20_2116	H (2019)	High
	Garranbeg	Moanarone	AV	SW_20_1454	M (2019)	Good
	Garrown	Derrynacaheragh	AV	SW_20_2076	G (2019)	High
	Glasheenacauha	Balteenbrack	AV	SW_20_760	P (2019)	Moderate
	Glasheenahielan	Kilronane West	AV	SW_20_1533	M (2019)	Moderate
	Kealrootha	Mohana	AV	SW_20_1533	P (2019)	Moderate



Catchment	River	Site name	Survey type	Water body ID	Previous status	2021 Status
		SWRBD				
	Sall	Aghaphona Br.	AV	SW_20_2202	G (2019)	High
	Sall	Finnis	AV	SW_20_2202	H (2019)	High
	Sall	Lisnagat Br.	AV	SW_20_2202	M (2019)	Moderate
	Tuough	Ballinacurra Br.	AV	SW_20_2132	H (2019)	High
	Tuough	Rathculleen South	AV	SW_20_1319	M (2019)	Moderate
Kerry Blackwater	Blackwater	Derreenagreer	AV	SW_21_1445	-	High
	Blackwater	Gearha	AV	SW_21_2203	-	Good
	Blackwater	Tooreennahone Ford	AV	SW_21_2195	-	Good
	Blackwater	u/s Lough Brin	AV	SW_21_7640	-	Good
	Derreendarragh	Derreendarragh	AV/SM	SW_21_2449	-	Moderate
Owenascaul	Garrivagh	An Com Dubh	AV/SM	SW_22_470	-	Good
	Derrygorman	NE of Anascaul	AV/SM	SW_22_3990	-	Good
	Derrygorman	u/s of Anascaul bridge	AV/SM	SW_22_3990	-	Moderate
	Owenascaul	Anascaul	AV/SM	SW_22_470	-	High
		SERBD				
Barrow/Cushina	Cushina	Kelly's Br.	AV	SE_14_1875	P (2015)	Poor
	Cushina	Enaghan	AV	SE_14_276	M (2015)	Moderate
	Eanagh	Lord Br.	AV	SE_14_276	M (2015)	Moderate
Barrow/Figile	Figile	Cushaling Br.	AV	SE_14_152	G (2015)	Bad
Barrow/Figile	Figile	Bog Road	AV	SE_14_152	B (2015)	Bad
Barrow/Owenass	Owenass	Owenass Br.	AV	SE_14_1718	P (2015)	Moderate
Barrow/Triogue	Triogue	Triogue Br.	AV	SE_14_1028	-	Moderate
Barrow	Barrow	Clonterry	AV	SE_14_196	M (2015)	N/A
	Barrow	Ballykeenan Lock	SM	SE_14_196	M (2015)	Moderate
	Barrow	Barrowmount	AV	SE_14_196	B (2015)	Moderate
	Barrow	Dunleckny	AV	SE_14_196	P (2015)	Moderate
	Barrow	Fishersgraigue	AV/SM	SE_14_196	G (2015)	Moderate
	Barrow	Bestfield	AV	SE_14_196	M (2015)	Moderate
	Barrow	Goresbridge Graveyard	AV/SM	SE_14_196	P (2015)	Poor
	Barrow	Ballyellin Tomb	AV	SE_14_196	G (2015)	Moderate
	Barrow	Ballyfoyle	AV	SE_14_196	P (2015)	Moderate
	Barrow	Belview	AV	SE_14_196	M (2015)	Moderate
	Barrow	Mortarstown Lower	AV	SE_14_196	M (2015)	Poor
	Barrow	Levitstown	AV	SE_14_196	P (2015)	Moderate
	Barrow	Barrowford	AV	SE_14_196	P (2015)	Moderate
	Barrow	Upper Tinnahinch Lock	AV/SM	SE_14_196	M (2015)	Poor
	Barrow	Graiguenamanagh Br.	SM	SE_14_196	P (2015)	Poor
	Barrow	Ardreigh	AV	SE_14_196	G (2015)	Moderate
	Barrow	Strawhall	AV	SE_14_196	P (2015)	Moderate
	Barrow	Bagenalstown	AV	SE_14_196	-	Poor
	Barrow	Levitstown Canal	AV	SE_14_196	-	N/A
	Barrow	Ballyellin Canal	AV/SM	SE_14_196	-	N/A
	Barrow	Burgage Canal	AV	SE_14_196	M (2015)	N/A



Sub catchment	River	Site name	Survey type	Water body ID	Previous status	2021 Status			
	SERBD								
Nore/Arrigle	Arrigle	Ballyconnaught	AV	SE_15_93	-	Good			
	Arrigle	Brabstown	AV	SE_15_93	-	High			
Nore/Ballyroan	Ballyroan	Ballydine Br.	AV/SM	SE_15_1938	M (2013)	Moderate			
	Ballyroan	Sallagh Br.	AV/SM	SE_15_1938	M (2017)	Poor			
Nore/Breagagh	Breagagh	Water Barrack Park	AV	SE_15_1269	-	Moderate			
	Breagagh	Shellumsrath	AV	SE_15_1515	-	Moderate			
	Drakeland middle	Michaelschurch	AV	SE_15_1515	-	Poor			
	Stony	Kylebeg South	AV	SE_15_1515	-	Poor			
Nore/Delour	Delour	Castleconor	AV	SE_15_259	-	Moderate			
	Delour	Garrafin Br.	AV	SE_15_911	-	Moderate			
	Killeen	Cardtown	AV	SE_15_1005	-	Good			
Nore/Dinin	Coolcullen	Philip's Br.	AV	SE_15_77	H (2017)	High			
	Clogh	Clogh Br.	AV	SE_15_959	P (2017)	Poor			
	Dinin	Ballyhimmin	AV	SE_15_109	-	Good			
	Dinin	Cloneen Br.	AV	SE_15_130	P (2017)	Moderate			
	Dinin	Dinin Br.	SM	SE_15_1955	G (2016)	Moderate			
	Dinin	u/s Cloneen Br.	AV	SE_15_130	-	Poor			
	Gloshia	Tobar Muire	AV	SE_15_348	G (2017)	High			
Nore/Erkina	Erkina	Beleady Br.	AV	SE_15_1425	G (2018)	Moderate			
	Erkina	Carrick Br.	AV	SE_15_1033	G (2018)	Moderate			
	Erkina	Coolkerry Br.	AV	SE_15_1033	-	Moderate			
	Erkina	Rathsaran Br.	AV	SE_15_1425	-	Moderate			
	Erkina	Rathsaran Glebe	AV	SE_15_1425	-	Moderate			
	Erkina	Errill Graveyard	AV	SE_15_1425	-	Moderate			
	Erkina	Durrow	AV	SE_15_198	-	High			
	Erkina	Harristown_Br.	AV	SE_15_371	-	Poor			
	Erkina	Kildellig	AV	SE_15_1858	-	Poor			
	Erkina	Ballygowdan	AV	SE_15_200	-	Poor			
	Erkina	Clarneyball Br.	AV	SE_15_1425	M (2019)	Moderate			
	Donaghmore	Donaghmore Br.	AV	SE_15_1033	-	Moderate			
	Donaghmore	Ballybrophy	AV	SE_15_363	-	Bad			
Nore/Goul	Ardreagh	Lisduff West	AV	SE_15_1199	-	Moderate			
	Ardeagh	Lisduff	AV	SE_15_1199	-	Good			
	Goul	Crossoges	AV	SE_15_1974	-	Good			
	Goul	Tranagh	AV	SE_15_196	-	Poor			
	Goul	Urlingford Castle	AV	SE_15_196	-	Good			
Nore/Gully	Gully	Gully Br.	AV	SE 15 1749	-	Moderate			
	Gully	Knockamullin	AV	SE_15_1749	-	High			
Nore/Mountrath	Mountrath	Clonard	AV	SE_15 1003	-	Moderate			
	Mountrath	Drim	AV	SE 15 1000	-	Good			
	Needleford stream	Paul's Hill	AV	SE 15 289	_	High			
Nore	Cappanacloghy	Derryroe	AV	SE 15 318	-	Poor			
	Cappanacloghy	The Hollow Br.	AV	SE_15_925	-	Moderate			



Sub catchment	River	Site name	Survey type	Water body ID	Previous status	2021 Status
		SERBD				
Nore	Cappanacloghy	Clondouglas	AV	SE_15_1250	-	Poor
	Derrymore	Derrymore	AV	SE_15_1050	-	Poor
	Dungarvan Glebe	Thomastown Hospital	AV	SE_15_1848	-	High
	Dungarvan Glebe	d/s Kilfane Br.	AV	SE_15_1848	-	Good
	Feathallagh	Clarabricken	AV	SE_15_368	-	Poor
	Gortavoata	Clonoonagh	AV	SE_15_1455	-	Good
	Kilderry	Kingsland	AV	SE_15_821	-	Moderate
	Lisdowney	Seskin_South	AV	SE_15_479	-	Moderate
	Lisdowney	u/s of Grange Br.	AV	SE_15_479	-	High
	Lismaken	Ballyhenry	AV	SE_15_1050	-	Good
	Nore (MC)	u/s Castletown Weir	AV	SE_15_1836	-	N/A
	Nore (MC)	Brownsbarn Br.	SM	SE_15_1994	G (2014)	N/A
	Nore (MC)	Clonakenny	AV	SE_15_1050	-	Good
	Nore (MC)	Quakers BrB	SM	SE_15_1018	G (2014)	Poor
	Nore (MC)	Quakers BrA	SM	SE_15_1018	G (2014)	Moderate
	Pococke	Foot Golf	AV	SE_15_1332	-	Moderate
Nore/Kings	Ballyphilip	Gortanassy East	AV	SE_15_301	-	Good
	Ballyphilip	Reabaun	AV	SE_15_222	-	Good
	Desart Stream	Greatwood	AV	SE_15_686	-	Moderate
	Ennisnag Stream	Baunlusk	AV	SE_15_143	-	Poor
	Ennisnag Stream	Sunhill	AV	SE_15_143	-	Bad
	Garranacool	Gortnasmuttaun South	AV	SE_15_1736	-	Moderate
	Kilkenny	d/s of Castletown Br.	AV	SE_15_1836	-	Good
	Kilkenny	Kells Mill	AV/SM	SE_15_1819	-	Good
	Kilkenny	West of Ennisnag Br.	AV/SM	SE_15_1819	-	N/A
	Kilkenny	Kells Br.	SM	SE_15_1819	M (2016)	Moderate
	Kilkenny	Killinny	AV/SM	SE_15_1819	M (2016)	Moderate
	Tullaroan Stream	Ballykeefe Br.	AV	SE_15_1986	-	Moderate
	Tullaroan stream	Tullaroan GAA Club	AV	SE_15_1986	-	Poor
	Rathleen	Fiddaun Lower	AV	SE_15_650	-	High
Nore/Nuenna	Arigna	Clashacrow	AV	SE_15_1824	G (2017)	Good
	Nuenna	Ballyguider Br.	AV	SE_15_75	G (2017)	Moderate
	Nuenna	Bawntanameenagh	AV	SE_15_1824	G (2017)	High
	Nuenna	Monabrika	AV	SE_15_946	-	Moderate
Nore/Owenbeg	Owenbeg	Baunogemeely	AV	SE_15_1421	-	Moderate
	Owenbeg	Castlecoole	AV	SE_15_1421	-	Moderate
	Owenbeg	Boleybeg Br. North	AV	SE_15_94	-	Moderate
	Owenbeg	Chapel Crossroads	AV	SE_15_94	-	Moderate
	Owenbeg	Rossconnell Br.	AV	SE_15_910	-	Moderate
Nore/Tonet	Tonet	Birchgrove Br.	AV	SE_15_1797	-	Poor



Sub catchment	River	Site name	Survey type	Water body ID	Previous status	2021 Status
		ERBD				
Blackwater (Kells)	Blackwater Kells	Just u/s L. Ramor	SM	EA_07_1035	M (2013)	Moderate
Dee	Dee	Br. at Drumcar	AV	NB_06_1099	M (2015)	Moderate
	Dee	Burley Br.	SM	NB_06_50	M (2014)	Moderate
White (Louth)	White (Louth)	Coneyburrow Br.	SM	NB_06_550	M (2017)	Poor
Fane	Fane	Br. d/s of Inniskeen	SM	GBNI1NB0606 04052	M (2018)	Good
		NWRBD				
Owentocker	Owentocker	500 m d/s Br. in Ardara	SM	NW_38_3037	G (2015)	Moderate
	Owenroe	Tullybane Br.	AV	NW_38_3022	-	Moderate
Swilly	Ballymacool	Upper Ballymacool	AV	NW_39_1303	-	N/A
	Corravaddy	Corranagh Br.	AV	NW_39_2547	-	Moderate
	Corravaddy	NW of Curragh	AV	NW_39_2547	-	Moderate
	Knockamona	Arena 7	AV	NW_39_2551	-	Poor
	Letterleague	Bomany Br.	AV	NW_39_932	-	Good
	Treanakeel	Treanakeel	AV/SM	NW_39_2210	-	Good
	Sprack Burn	High Road	AV	NW_39_2323	-	Bad
	Swilly	Altadush	AV/SM	NW_39_2208	P (2014)	Poor
	Swilly	Rashedoge	AV	NW_39_1508	-	Moderate
	Swilly	Swilly Br.	AV/SM	NW_39_1508	G (2017)	Good
		WRBD				
Ballinglen	Clydagh	Clydagh South	AV/SM	WE_33_1752	-	Poor
	Glenedagh	Glenedagh Eighter	AV/SM	WE_33_1752	-	Moderate
	Ballinglen	Ballinglen Br.	SM	WE_33_2091	M (2015)	Poor
	Ballinglen	East Ford	AV/SM	WE_33_1752	-	Good
	Ballinglen	Kilkeerglen West	AV/SM	WE_33_1752	-	Good
	Keerglen	Kilkeerglen	AV/SM	WE_33_1738	-	Moderate
Corrib	Cloghbrack Stream	Tonlegee	AV	WE_30_3441	G (2019)	Moderate
	Cloghbrack Stream	d/s of Tonlegee BrA	AV	WE_30_3441	-	Good
	Cloghbrack Stream	d/s of Tonlegee BrB	AV	WE_30_3441	-	Good
Dunneill	Carrowcor	Carrowcor Br.	AV	WE_35_542	G (2012)	Moderate
	Doonbeakin	Altans	AV	WE_35_542	-	Good
	Doonbeakin	Doonbeakin	AV	WE_35_3210	-	Moderate
	Doonbeakin	Sligo Way	AV	WE_35_3210	-	N/A
	Dunneill	Ballygilcash Br	AV/SM	WE_35_3210	-	Moderate
	Dunneill	Behind Farm	AV/SM	WE_35_3210	-	Good
	Dunneill	Dromore West	SM	WE_35_3210	G (2012)	Good
	Dunneill	Dunneill North	AV	WE_35_3210	-	Good
	Dunneill	Windfarm	AV	WE_35_3210	-	Moderate
	Owenduff	Dunowla East	AV	WE_35_3210	-	Poor
Corrib/Owenriff	Bunowen	Knockbaun	AV/SM	WE_30_3396	M (2018)	Good
	Bunowen	North of L. Ateeann	AV/SM	WE_30_3396	H (2018)	Good
	Bunowen	u/s L. Ateeann	AV/SM	WE_30_3396	M (2017)	Good



Sub catchment	River	Site name	Survey type	Water body ID	Previous status	2021 status
		WRBD				
Corrib/Owenriff	Canrawer	Canrawer West	AV/SM	WE_30_3396	P (2018)	Poor
	Clooshgereen	Clooshgereen Track	AV/SM	WE_30_1787	G (2018)	Moderate
	Clooshgereen	Clooshgereen	AV/SM	WE_30_1787	M (2018)	Poor
	Clooshgereen	Rusheeny East	AV/SM	WE_30_1787	-	Moderate
	Derryerglinna	u/s Derryerglinna Br.	AV/SM	WE_30_1531	P (2018)	Bad
	Derryglinna	L. Adrehid	AV/SM	WE_30_1531	-	Bad
	Derrylaura	Clare	AV/SM	WE_30_3396	G (2018)	Good
	Glengawbeg	Lake Outflow	AV/SM	WE_30_3396	-	Moderate
	Glengawbeg	Glengawbeg Br	AV	WE_30_3396	P (2018)	Poor
	Glengawbeg	Glengawbeg Lower	AV/SM	WE_30_3396	-	Poor
	Glengawbeg	Glengawbeg Upper	AV	WE_30_3396	-	Moderate
	Knockmoyle	Knockmoyle Br	AV/SM	WE_30_1531	G (2018)	Good
	Knockmoyle	Knockmoyle	AV/SM	WE_30_1531	G (2017)	Poor
	Letterfore	Letterfore Channel	AV/SM	WE_30_1531	-	Moderate
	Letterfore	Letterfore Track	AV/SM	WE_30_1531	G (2018)	Moderate
	Letterfore	Letterfore	AV/SM	WE_30_1531	M (2018)	Moderate
	Rusheeny	Rusheeny Forest	AV/SM	WE_30_2684	H (2018)	Poor
	Owenriff	1km d/s of Lough Agraffard	SM	WE_30_3396	G (2018)	High
	Owenriff	Carrowmanagh	AV/SM	WE_30_3396	-	Moderate
	Owenriff	Glengowla Mine	AV/SM	WE_30_3396	M (2018)	Moderate
	Owenriff	Sweeney's Hotel	AV/SM	WE_30_3396	N/A	Moderate
	Owenriff	Water Tower	SM	 WE_30_3396	M (2018)	Moderate
	Owenriff	d/s of Hatchery	AV/SM	WE_30_3396	N/A	Good
		SHRBD				
Caher	Caher	Br. 2 km d/s Formoyle	SM	SH_28_106	G (2016)	Moderate
	Caher	Derrynavanagh	AV	 SH 28 106	-	Moderate
	Caher	Fanore Br.	AV/SM	 SH 28 106	-	N/A
	Caher	Murroogh	AV/SM	SH 28 106	-	Poor
Camlin	Camlin	Aghaward Br.	AV	SH 26 3927	-	Good
	Camlin	Ballynascraw	AV	 SH 26 3927	-	Poor
	Camlin	Creenagh	AV	 SH 26 3927	-	Poor
	Camlin	Br. W. of Lisnabo	SM	 SH 26 3927	P (2015)	Poor
	Camlin	d/s Ballykenny Br	AV	 SH 26 3927	-	Poor
	Camlin	Derryharrow	AV	 SH 26 3927	-	Poor
	Camlin	Drumnahara	AV	 SH 26 3927	-	Poor
	Camlin	Kilnatruan Cross Rds.	AV	 SH 26 3927	-	Poor
	Camlin	Soran Southeast	AV	 SH 26 3927	-	Moderate
	Camlin	Lisnamuck	AV	 SH_26 1197	-	Good
	Camlin	Moat Farrell	AV	SH 26 2862	_	Poor
	Camlin	Creeve	AV	SH 26 3945	-	Good
	Camlin	Mount Jessop Br.	AV	SH 26 4116	-	Moderate
	Camlin	Prucklishtown	AV	SH 26 3009	_	Moderate
	Camlin	u/s of Gorteen Lough	AV	SH_26_2862	-	Poor



Sub catchment	River	Site name	Survey type	Water body ID	Previous status	2021 status
		SHRBD				
Camlin	Fallan	Ballyclare	AV	SH_26_2726	-	Moderate
	Fallan	Calfpark	AV	SH_26_2726	-	Moderate
	Rhine	Ballymacroly	AV	SH_26_1082	-	Poor
Little Brosna/Camcor	Camcor	Drumcullen Br.	AV	SH_25_2084	-	Moderate
	Camcor	Drumbane Br.	AV	SH_25_1830	-	Poor
	Camcor	Oxmantown Br.	AV	SH_25_1830	-	Poor
	Camcor	u/s Maltings Pool	AV	SH_25_1830	-	Moderate
	Camcor	Upper Oxmantown Br.	AV	SH_25_1830	-	Moderate
	Breaghmore	Knockarey Br.	AV	SH_25_3723	-	Moderate
	Breaghmore	Lofus Br.	AV	SH_25_3432	-	Moderate
	Breaghmore	Breaghmore Br.	AV	SH_25_3432	-	Moderate
	Fuarawn	Grange	AV	SH_25_625	-	Moderate
	Fuarawn	Clareen	AV	SH_25_5	-	Moderate
	Glenafelly	Ballyshane Br.	AV/SM	SH_25_779	-	Moderate
	Glenafelly	Br. 3km E of Longford	SM	SH_25_779	P (2020)	Moderate
	Knockbarron	E. of Pass Crossroads	AV	SH_25_2084	-	Moderate
	Roscomore	Hundredacres	AV	SH_25_3432	-	Poor
Little Brosna	Black	Dunnes _Br.	AV	SH_25_3468	-	Poor
	Bunow	Benamore_Br.	AV	SH_25_344	M (2015)	Good
	Bunow	Killavilla_Br.	AV	SH_25_344	G (2015)	Good
	Bunow	Willison_Br	AV	SH_25_344	M (2015)	Poor
	Glasderry	Agnadouglas	AV	SH_25_633	-	Moderate
	Glasderry	Roscrea	AV	SH_25_633	-	Good
	Golden Grove	Ballyrickard More	AV	SH_25_2199	-	Poor
	Keeloge	South of Motte	AV	SH_25_3734	-	N/A
	Keeloge	Franckfort	AV	SH_25_3734	-	Moderate
	Kilcomin stream	Caolroe Br.	AV	SH_25_3676	-	Moderate
	Kilcomin stream	Cloghmoyle	AV	SH_25_	-	Moderate
	Kilcomin stream	Clucka North	AV	SH_25_3676	-	Moderate
	Kilcomin stream	Driminduff	AV	SH_25_3468	-	Moderate
	Little Brosna	Clonlisk Br.	AV	SH_25_633	-	Moderate
	Little Brosna	Gorteen	AV	SH_25_344	-	N/A
	Little Brosna	Ballindarra	AV/SM	SH_25_633	-	Moderate
	Little Brosna	Riverstown BrA	SM	SH_25_633	G (2015)	Moderate
	Moutheaton	Moutheaton	AV	SH_25_633	-	N/A
	Pallas	Holy Well	AV	SH_25_2092	-	Moderate
	Pallas	Pallas Br.	AV	SH_25_2092	-	Moderate
	Rock	Whiteford	AV	SH_25_3344	-	Moderate
Inny	Inny	Br. 1 km S of Oldcastle	SM	SH_26_2060	G (2020)	Good
Inny/Mountnugent	Mountnugent	Mountnugent Br. A	SM	SH_26_2742	G (2020)	Moderate
	Mountnugent	Mountnugent Br. B	SM	SH_26_2742	G (2020)	Moderate





Fig. 4.22. Fish ecological status of river sites surveyed during 2021 using the FCS2-Ireland ecological classification tool.



# 4.2.3 Ecological status – Summary of 2019-2021

Between 2019 and 2021, 790 river sites were surveyed and assigned a fish ecological status (Fig 4.25). Of these sites 38.4% were assigned a status of High or Good and 59.0% of sites failed to meet the required standard of at least Good status. The remaining 2.7% of sites were not assigned a status following sense-checking using available data and expert opinion (Fig.4.23 and 4.25).



# Fig. 4.23. Fish ecological status of river sites surveyed between 2019-2021. Status was assigned using the FCS2-Ireland ecological classification tool.

A total of 231 river sites had previously been assigned a fish ecological status. Of these 49.8% were unchanged (stable) when compared to previous surveys. An improvement in status was observed at 20.8% of sites, while 29.4% of sites showed a deterioration in status (Fig. 4.24).



Fig. 4.24. Fish ecological status trends between 2019-2021 in Irish rivers.





Fig. 4.25. Fish ecological status of river sites surveyed between 2019-2021 using the FCS2-Ireland ecological classification tool.



# 4.3 Transitional waters

# 4.3.1 Fish species distribution and species richness

A total of 46 fish species were captured across the five transitional water bodies surveyed in 2021. Four species, sand goby, thick-lipped mullet, European eel and three-spined stickleback were recorded in all five waterbodies.

Species richness (SR), the number of species captured, is a strong indicator of the health of transitional water bodies. Table 4.5 shows the species richness recorded at each transitional water in 2021. Species richness ranged from seven species in Lough Gill to 33 species in the Lower Shannon Estuary.

# 4.1.2 Fish ecological status - Classification of Transitional waters using 'EMFI'

All five transitional waterbodies surveyed during 2021 were assigned a fish ecological status class using the EMFI ecological classification tool (Harrison and Kelly, 2013). Three waterbodies (60%) were classified as having Good ecological status and two (40%) as Poor (Table 4.5, Figure 4.26).

All five transitional waters had been surveyed previously (Table 4.5). Three waterbodies (60%) showed no change in ecological status, one water body, Limerick Dock, deteriorated and one waterbody, Lough Drongawn improved in status (Table 4.5).

Water body	WFD SM Code	Survey type	SR	Dominant species		Previous Status	2021 status
				Scientific	Common		
				name	name		
				Gasterosteus	Three-spined		
Lough Gill	SH_040_0100	SM	7	aculeatus	stickleback	P (2016)	Poor
Lower							
Shannon	SH_060_0300	SM	33	Sprattus	Sprat	G (2017)	Good
				Gasterosteus	Three-spined		
Limerick Dock	SH_060_0900	SM	8	aculeatus	stickleback	M (2014)	Poor
Castlemaine				Atherina			
Harbour	SW_230_0200	SM	28	presbyter	Sand smelt	G (2018)	Good
Lough				Atherina			
Drongawn	SW 190 0500	SM	12	presbyter	Sand smelt	M (2016	Good

# Table 4.5 Species richness (SR) and fish ecological status of transitional waters surveyed in 2021.





Fig. 4.26. Ecological status of transitional waters surveyed during 2021 using the EMFI ecological classification tool.



# 4.3.3 Ecological status – Summary of 2019-2021

Between 2019 and 2021, 24 transitional waterbodies were surveyed and assigned a fish ecological status. (Fig 4.29). Of these, 50.0% were assigned a status of High or Good and 50.0% of sites failed to meet the required standard of at least Good status (Fig.4.27).



# Fig. 4.27. Ecological status of transitional waters surveyed between 2019-2021 using the EMFI ecological classification tool.

A total of 22 transitional waterbodies had previously been assigned a fish ecological status. Of these 82.6% remained unchanged (stable) compared to previous surveys. There was an improved status observed on 8.7% of waterbodies, while 8.7% deteriorated in status (Fig. 4.28).









Plate 4.2. Thornback ray being released in the Shannon Estuary in the SHRBD.





Fig. 4.29. Ecological status of transitional waterbodies surveyed between 2019-2021 using the EMFI ecological classification tool.



# 5. DISCUSSION

# 5.1 Lakes

A total of 16 fish species and hybrids (sea trout are included as a separate "variety" of trout) were recorded across the lake waterbodies surveyed during 2021. European eels were the most widely distributed species recorded, occurring in 22 lakes surveyed in 2021. Perch was also the most abundant species, being found in 16 lakes and recorded as the dominant species in 12 of these lakes.

Fourteen lake waterbodies (52%) were assigned a fish ecological status of High or Good for 2021, five (18.5%) as Moderate status, three (11%) as Poor and five (18.5%) as Bad. IFI (2018) described how pike had been introduced to the Owenriff catchment in the recent past. The presence of this species in Loughs Adrehid, Shanaghree, Ateeann, and Loughaphreaghaun, is the most likely reason for the Bad status result for these lakes; however evidence of enrichment (as indicated by high levels of filamentous algae) was observed in Loughaphreaghaun during July 2021.

When compared to previous surveys the ecological status of 21 lake waterbodies has remained stable. Four lakes, Lough Muckno, Templehouse Lake, Urlaur Lough and Lattone Lough have shown an improvement in status between surveys. This improvement in status, is likely due to the reduction of tolerant fish species (cyprinid) biomass in these lakes and may be an indication that water quality has improved. Two lakes, Lough Atedaun and Kiltooris Lough showed a deterioration in status between surveys. The most likely reason for the deterioration in Lough Atedaun, was an increase in tolerant (cyprinid) species biomass which may indicate a decline in water quality.

### 5.2 Rivers

A total of 16 fish species and hybrid varieties (sea trout are included as a separate "variety" of trout) were recorded across the river sites surveyed during 2021. Brown trout was most widely distributed species. Salmon were also widely distributed across the six RBDs.

Overall, 280 river sites surveyed during 2021 were assigned a fish ecological status. Following a quality assurance exercise, 14 sites were not assigned status. Of the sites classified, 87 sites were classified as High to Good. The remaining sites failed to meet the ecological standard with 132 sites classified as Moderate, 54 as Poor and seven as Bad. A total of 119 sites had previously been surveyed and classified. Of these the status of 51 sites remained unchanged between surveys, while 34 sites deteriorated and 31 showed an improved status.



Where a site showed an improvement in ecological status between surveys, the reason was generally due to an increase in the abundance of type specific fish species, or the presence of an age cohort not recorded in previous surveys, i.e. indicating an improvement in recruitment status.

The most common reason for a site deteriorating between surveys was a decrease in the abundance of type specific fish species (and/or age cohorts) caused by various pressures such as water quality and presence of barriers to fish migration. In some cases, an age cohort previously recorded at the site was not captured during the most recent survey, indicating a failure in recruitment. This suggests either water quality issues, physical habit degradation or a combination of both and other pressures that affect fish species recruitment and persistence. Poulnaberry bridge and Coolmountain bridge on the River Caha in the Bandon were assigned a Moderate ecological status in 2021. In 2019 both sites had been assigned a Good status. The most likely reason for this deterioration is the fact that salmon fry, present in 2019, were absent from the recent survey. More details on individual catchments will be available in due course (see www.wfdfish.ie).

An increase or relatively high abundance of tolerant fish species such as minnow, three-spined stickleback or stone loach at a river site can be an indicator of a deterioration in water quality (Kelly *et al.*, 2007b). For example, one site, Coneyburrow Bridge on the White River in Louth, deteriorated from Moderate to Poor fish ecological status between 2017 and 2021. A relatively high density of minnow, stone loach and 3-spined stickleback was recorded at this site in 2021. This may be an indication of a decline in water quality at this site.

### 5.3 Transitional waters

A total of 46 species were captured across the five transitional waters surveyed in 2021. Four species, sand goby, thick-lipped mullet, European eel and three-spined stickleback were the most widely distributed species, recorded in all four waterbodies.

The Lower Shannon Estuary had the highest species richness with 33 species recorded. Lough Gill had the lowest species richness with seven species recorded.

The EMFI ecological classification tool, together with expert opinion was used to assign ecological status to the five transitional waterbodies surveyed in 2021. Three of the waterbodies surveyed, Castlemaine Harbour, Lower Shannon estuary and Lough Drongawn were assigned a classification of Good. Two waterbodies, Limerick Dock and Lough Gill were assigned Poor status.

Three waterbodies, the Lower Shannon Estuary, Castlemaine Harbour and Lough Gill showed an unchanged ecological fish status between recent surveys. Lough Drongawn showed an improvement



in fish ecological status between surveys. This is likely due to a reduction in three-spined stickleback abundance. The fish ecological status in Limerick Docks deteriorated between surveys. The most likely reason for this deterioration was the decrease in species richness recorded in the recent survey.



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