Energy for generations

ESB FISHERIES CONSERVATION ANNUAL REPORT

(YEAR ENDING DECEMBER 2022)

A report on ESB Fisheries Conservation activities to the Department of Environment, Climate and Communications.

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Introduction

Over the past year, ESB continued to invest in managing, conducting and preserving fisheries in the river catchment areas where we own and operate hydroelectric facilities.

We have hydroelectric stations on five rivers across Ireland, with a combined production capacity of 220MW. Together, they provide enough renewable energy to supply up to 180,000 customers, contributing to ESB's Driven to Make a Difference: Net Zero by 2040 strategy. Complementing ESB's overarching ambition to eliminate carbon from electricity, our strategy commits to stepping forward on social and environmental responsibility.

ESB's fisheries conservation team contributes significantly to meeting this objective, focusing on a range of activities to positively impact Irish fish stocks and waterways. During 2022, this included river habitat restoration programmes, eel trap and transport schemes, fisheries management activities, and the operation of three salmon hatcheries.

ESB, in collaboration with partners, seeks to minimize the impact of its operations and to conserve and enhance fish stocks in the Shannon, Liffey, Lee, Erne and the Clady and Crolly rivers.

This report provides a detailed overview of steps taken in 2022 to protect fisheries and improve the amenity value of the waterways.

Our work is greatly enhanced through the support and partnership of local and national stakeholders including angling clubs, community groups, University College Cork, Queens University Belfast, Inland Fisheries Ireland, The Marine Institute, The Department of Communication, Climate Action, and Environment, and The Department of Agriculture, Environment and Rural Affairs, Northern Ireland.

On behalf of ESB, I would like to thank our stakeholders for their expertise and support over the past year.

In line with our strategic commitment to stepping forward in the area of social and environmental responsibility, we are conducting a wide ranging review of ESB's Fisheries Strategy, including consultation with key stakeholders focusing on the areas of fish conservation, biodiversity and community wellbeing. I look forward to sharing details of our progress in the report for 2023.

Take care,
Paddy

Paddy Hayes,
Chief Executive, ESB

Notes

Chapter 1. River's Introduction

1.1. The River Shannon An T'Sionainn

The River Shannon catchment area including that of the estuary, covers approximately 17% of the area of Ireland. It is the longest river in the British Isles and has a total main channel length of almost 400km, of which 25% is estuarine. The lakes of the catchment are naturally productive and can be generally classified as either semi-enriched (mesotrophic) or enriched (eutrophic). Much of the main river channel is lake like in character reflecting its size, regulated flow and low gradient (falling just 20m over 200km, south of Lough Allen). The largest of the Shannon lakes are Loughs Allen (35km^2), Ree (105km^2) and Derg (117km^2), with the most important tributaries of the Shannon being the Boyle and Suck to the west and the Inny, Brosna, Little Brosna, Nenagh and Mulkear to the east.

Discharge on the River Shannon is regulated at Parteen Regulating Weir. Parteen Regulating Weir diverts water into a headrace canal supplying the 85MW Ardnacrusha generating station and allows a statutory compensation flow (10m^{3}sec^{-1}), equal to the low summer flow before the Shannon scheme, to flow down the Old Shannon River channel.

Ardnacrusha generating station, constructed between 1925 and 1929, harnesses the 10,400km^2 of the catchment area upstream. During the 1930's, Ardnacrusha supplied almost 90% of the electricity needs but today it accounts for less than 3% of the Republic of Ireland's requirement. However, the ability to generate electricity at short notice when electricity demand suddenly increases makes it very important generation asset.

ESB controls the fishing rights of the entire River Shannon and the role of the maintenance and preservation of the entire fishery resources is undertaken by ESB Fisheries Conservation. The River Shannon fisheries are managed in co-operation with:

- Inland Fisheries Ireland (IFI)
- The "Department of Environment, Climate and Communications
- The Marine Institute

In addition to the above agencies, both angling and community groups are becoming increasingly involved. ESB extends this strong co-operative approach to the management of the Shannon fisheries with Inland Fisheries Ireland staff and the Shannon Fisheries Partnership Group. ESB also utilises the services of the Marine Institute.

A view of the Ardnacrusha station navigation lock.

An outline of the various programmes of work that ESB Fisheries are involved with, and the time periods involved are shown in Table 1.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Task
												Silver eel Trap and Transport
												Juvenile eel Trap and Transport
												Tree/Shrub clearance (NPWS)
												Instream habitat works
												Electrical fishing surveys
												Construction of fishing stands, styles, footbridges
												Adult broodstock trapping
												Stripping broodstock
												Hatchery egg to fry stage
												Restocking juvenile salmon (unfed fry, parr)
												Smolt release
												Fish Counters (Ardnacrusha and Parteen)

Table 1. The annual work programmes completed by ESB staff during the year.

IFI drone footage showing the 'Island Field' and 'Barrack Lane' stretches of the Lower Shannon Fishery.

1.2. The River Erne An Éirne

The River Erne is a transboundary river system, with large stretches in both Northern Ireland and the Republic of Ireland. It has a catchment area of 4,374km^2, rises in Co. Cavan and flows for almost 100km through Loughs Gowna and Oughter and Upper and Lower Lough Erne before entering the sea at Ballyshannon, Co. Donegal.

The hydroelectric scheme was constructed during 1946-1955 and consists of two generating stations. The capacity of the Erne scheme today is 20MW at Cliff and 45MW at Cathaleen's Fall. The hydro scheme involved major drainage works within the mid–catchment area and significant cross border co-operation during its construction. A total of 98.8% of the catchment area is harnessed for hydroelectricity generation. The scheme also involved the creation of Assaroe Lake (2.3km^2) between the two hydroelectric installations. The River Erne has an average annual flow of 98.1m^{3}sec^{-1}.

ESB owns the fishing rights in the Lower River Erne, Assaroe Lake and some tributaries in Co. Donegal. The remaining catchment area of the Erne is under the control of the Department of Agriculture, Environment and Rural Affairs (DAERA, Northern Ireland) and Inland Fisheries Ireland (IFI).

1.3. Clady and Crolly An Chláidigh agus an Chroithlí

The Clady River, situated in North Donegal was harnessed for the generation of electricity during the 1950's. The scheme involved the creation of a diversion canal and penstock from the Clady River approximately 3km from the sea and the transfer via this canal and penstock to a generating station, which discharges to the Crolly estuary. Both small moorland river systems have a combined catchment area of 153km^2. The Clady drains Lough Nacung, the outflow of which is regulated by Gweedore regulating weir. Due to the diversion of water, Clady salmon destined for the River Clady may enter the Crolly estuary at times depending upon discharge.

ESB owns the fishing rights of the entire Clady catchment. It also has ownership of the Crolly catchment from the lower section of L. Anure (including a portion of L. Anure).

1.4. The River Liffey An Life

The River Liffey, having a catchment area of 1,369km^2, rises in the Wicklow mountains and flows over 50km before entering the sea at Dublin. Three hydroelectric generating stations were constructed on the river during the 1940's. In addition to the supply of water for hydroelectric generation, the 5,600-acre reservoir also provides a water supply to Dublin city. A total of 62% of the catchment lies above Leixlip generating station, which was commissioned in 1949. The two upstream stations, Poulaphouca and Golden Falls are situated above and at the historical upper limit of salmon distribution in the catchment, respectively.

In addition to salmon and brown trout, the River Liffey holds stocks of roach, bream, roach-bream hybrids, perch, tench, pike, rudd and eel. Coarse fishing predominates on the Leixlip and Poulaphouca reservoirs, whereas the best trout fishing is from Lucan upstream. The best salmon fishing is noted on the stretch of river between Straffan and Islandbridge. ESB controls the fishing rights on the reservoirs, and in the immediate vicinity of the power stations.

1.5. River Lee An Laoí

The River Lee flows eastwards for over 90km and has a catchment area of 1,253km^2 and a mountainous region near Gougane Barra Lake in an average flow of 27.1m^{3}sec^{-1}. West Cork to enter the sea at Cork City (Figure 1).

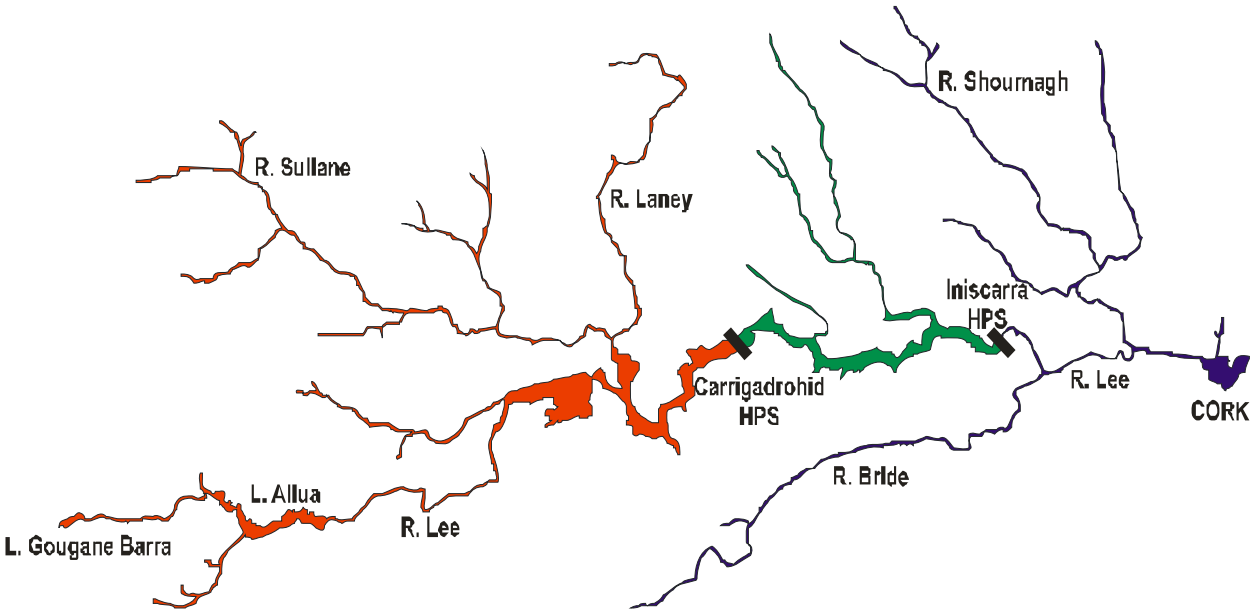


Figure 1. The River Lee catchment with the lower, middle and upper catchment areas differentiated by colour.

Blackrock Castle on the River Lee.

The central valleys of the River Lee were flooded as the result of construction of the hydroelectric scheme. Construction commenced in 1953, and both Carrigadrohid and Iniscarra generating stations were commissioned in 1957. Two large reservoirs were created, Carrigadrohid (5.3km^2) and Iniscarra (9.3km^2), upstream of both stations. A significant percentage (27%) of the Lee catchment is located downstream of the hydroelectric station and this area comprises the Shournagh, Martin and Bride tributaries where naturally spawned salmon stocks occur. The tidal section of the River Lee is approximately 14.5km downstream of Iniscarra. The fishing rights of the reservoirs and some river stretches located downstream of Iniscarra dam are controlled by ESB.

In addition to salmon and eel, the other main fishable species within the Lee system also include brown trout, pike, perch, rudd, roach and bream. The River Lee offers some excellent coarse fish angling, as there are significant stocks of coarse fish species within each of the two reservoirs.

Iniscarra station showing the summer spillage of oxygenated water which is the River Lee statutory minimum flow.

Iniscarra station.

Chapter 2. Atlantic Salmon

2.1 The River Shannon Salmon

With the initiation of the River Shannon Salmon Management Programme in 1990, ESB has been proactive in the conservation of the salmon population of the River Shannon. Prior to the Shannon Scheme, the river was renowned as a producer of large multi-sea winter salmon and grilse. With the advent of the hydroelectric scheme, there was a significant reduction of the spawning and nursery habitat in the Old River Shannon channel. In 1959, a Borland–MacDonald fish-lock was constructed at Ardnacrusha and a hatchery unit was constructed at Parteen Regulating Weir. Mitigation measures involved the restocking of the Shannon catchment with annual releases of juvenile salmon produced at this hatchery. However, although the Shannon scheme caused major changes for salmon in the river, the impact of extensive drainage schemes, water regulation and canalisation, intensive farming, afforestation and water pollution have also impacted negatively. Increased marine and coastal exploitation levels since the 1960's followed by the incidence of Ulcerated Dermal Necrosis (UDN), and more recently decreasing marine survival have also added to the reduction in numbers of self-sustaining stocks of salmon (Figure 2).

The 'Longshore' area of the River Shannon where the Ardnacrusha tailrace enters the Old River Shannon.

A section of the Ardnacrusha tailrace.

Angling on the 'Longshore' area of the Lower River Shannon.

The overall purpose of the programme is to assist the recovery of wild salmon populations in the cascade catchment area, provide reared smolt to support the recreational fisheries in the Lower Shannon and to protect the biodiversity and ecological productivity of wild salmon populations in the Shannon catchment.

The more specific objectives of the programme were:

- To ensure that the maximum possible number of salmon enter the cascade catchment annually to spawn.
- To investigate fish passage issues for adult and juvenile migrating salmon. Specific areas to be investigated were:

1. The efficiency rate of the Borland MacDonald fish lift located in Ardnacrusha.
2. Smolt passage through a Kaplan turbine located at Ardnacrusha was independently assessed based upon the results of a Heisey Tag test in 2004. The survival rate of smolt migrating during the annual Ardnacrusha salmon smolt generation protocol has been calculated at 89.4%
3. To increase understanding of salmon populations using micro tagged batch releases of salmon parr, an extensive electrofishing programme and continued restocking of both unfed fry and parr.

- To involve as many statutory and community groups as possible in the execution of the programme.
- An instream and bank side habitat enhancement programme will be applied to selected catchments.

Since 1991, all hatchery reared smolt have been adipose fin-clipped and selected breeding lines have been micro tagged, thus allowing the separation of reared, wild, grilse and multi sea-winter adult salmon. The restocking programme since 1991 has moved to large scale unfed fry planting with the retention of a number of unfed fry for smolt production the following year. These unfed fry plantings are evaluated using electric fishing equipment. The performance of these unfed fry has generally been good compared to the first baseline survey (1990-1992).

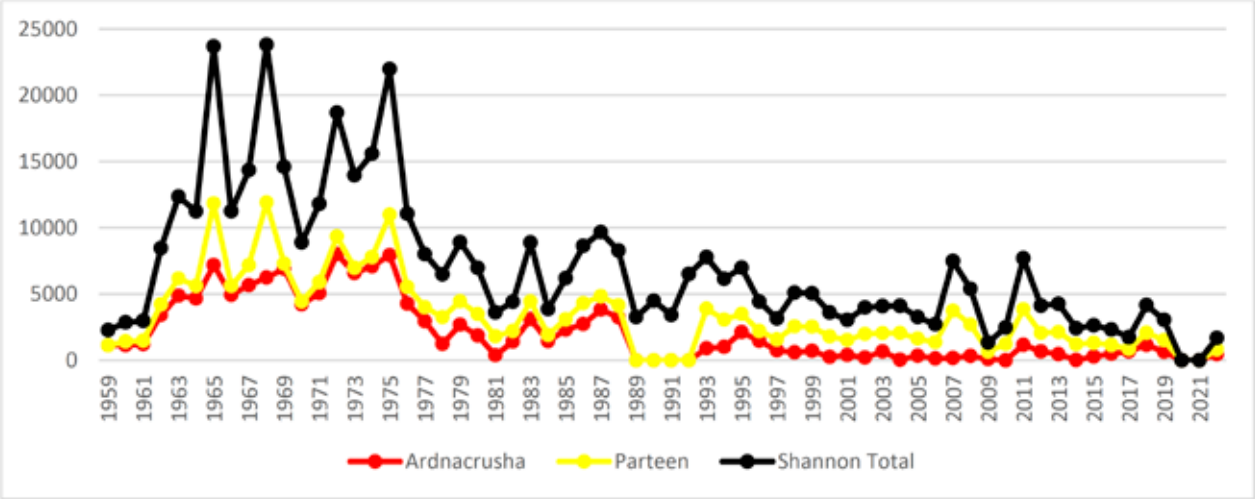


Figure 2. The number of ascending adult salmon through Ardnacrusha and Parteen Regulating Weir on the Lower Shannon catchment for the period 1960 to 2022.

River Shannon Salmon Hatchery and ranching activity Breeding and Genetics Programme

The Parteen Salmon Breeding Programme was initiated in 1990 and was carried out under the supervision of NUI, Galway. The mass selection-breeding programme involves two main breeding lines (grilse or one-sea winter fish, and Multi-Sea Winter (MSW) fish), that have been held separately since the start of the Programme. These two fish types are bred and reared separately at the hatchery prior to release to the sea as smolts. The two main objectives of the programme were to:

- Use selective breeding to significantly increase the percentage of fish returning as MSW salmon.
- To increase the weight of both MSW and grilse salmon.

Grilse lines, which were specifically bred for an increased size and weight, have given the expected improvement in the selected trait for fish captured at sea and those returning to the hatchery. Once the selective breeding programme was initiated in 1990 the proportion of returning two sea-winter spring fish increased dramatically with up to 66% of all females being two sea-winter fish. However, for males the return rate was, and remains much lower, so much so that they are often in short supply for breeding purposes.

In summary, the River Shannon salmon breeding programme at Parteen since 1990 has:

- Established pedigreed grilse and two-sea winter lines of salmon returning to the River Shannon.
- Increased significantly the proportion of two sea-winter salmon in the return to the River Shannon and to the hatchery.
- Proved that selective breeding can increase significantly the size and weight of returning grilse.
- Provided hypotheses to explain the inheritance of maturation phenotypes in salmon.
- Shown that males grow faster than females at sea.
- Given an indication that females return to the coast earlier than males.
- Provided pedigreed salmon for breeding experiments and stimulated further genetic research on salmon.

Future breeding protocols will be aimed at increasing the genetic variability within the selected two sea-winter lines by crossing between year classes. Inevitably, some of the gains achieved so far will be reduced, but it will ensure the genetic health of the lines for the future.

The genetic sampling of all returning hatchery bred fish and the hatchery fish used in the brood stock programme continued in 2022. The sub-sampling of the fish classified as wild also continued but was restricted when compared with previous years. In respect to the former, a collection of samples, from which DNA can be retrieved, exist now for every fish returning to the hatchery between 2010 and 2022. The combination of this material, in addition to information on each individual's size, sex and age, including potentially information on individual parentage, make this a very valuable resource for research and ultimately for the management of the hatchery programme.

A view of the lower section of the navigation lock in Ardnacrusha station.

A view of the of the boom located below Ardnacrusha station.

A view from the innermost section of the Ardnacrusha navigation lock.

A view of the Ardnacrusha navigation lock looking upstream.

Parteen Hatchery

Parteen hatchery was constructed at Parteen Regulating Weir in 1959 and was extended in 1970. A phased refurbishment project was initiated in 1997 and the hatchery now has a capacity to incubate up to 4 million salmon ova with an upper limit of 400 pairs of salmon. The hatchery infrastructure has been improved further with the provision of a new water intake line and filtration system. In addition, a new food control sequence for feeding fish was added. Approximately 90,000 adipose fin-clipped smolt are released each year as part of the ranching programme. The main goal of the conservation hatchery is to assist the recovery of wild salmon populations upstream of Parteen and Ardnacrusha and secondly to increase knowledge of salmon using an educational centre. An educational centre located at the hatchery provides a resource for visiting school tours and other interested parties. Present management of the ESB hatchery has continued to be of a high standard (ISO 14001).

Over the past 30 years, surplus ova and juvenile salmon have been used at both national and international levels to help restore salmon stocks of the Rivers Erne, Lee, Deel and the Rhine, Meuse and Thames. In the past, large numbers of Shannon ova were supplied to outside agencies. The use of Shannon ova in these European salmon restoration schemes promotes international fisheries co-operation and Ireland's unique freshwater fisheries resource. However, in more recent times the Shannon hatchery stock have been used exclusively for the restoration of Shannon salmon stocks.

Production of juvenile hatchery reared salmon

Due to a lack of stock arising from a loss of circa 100,000 first feeding fry stock, there was no juvenile salmon restocking of the Upper Shannon catchment in 2022. The Parteen juvenile salmon mortalities occurred due to an algal bloom entering the 'first-feeding' water supply. A series of hatchery upgrade works commenced in the summer of 2022, which included a plan to provide filtered water supplies and better automated monitoring.

		Salmon type	
Date of release	**Finclipped and tagged**	**Finclipped**	
April 8th	30,455		Fin clipped and tagged
April 8th		60,240	Fin clipped

Table 2. The number of salmon smolts released from Parteen hatchery in 2022.

A total of 90,695 fin-clipped salmon smolts were released using a fish pump from Parteen hatchery. These comprised both multi sea-winter (MSW) smolt and grilse (one sea- winter fish), during April 2022 (Table 2).

Characteristics of hatchery broodstock collected at Parteen during 2022

Identical Grilse and MSW (Multi-Sea Winter) designation characteristics are used for Parteen, Carrigadrohid and Ballyshannon hatcheries. These characteristics are that females up to 71cm and males up to 84cm are One-Sea Winter (1SW) or grilse, whereas salmon larger than these are considered to be MSW salmon. Using these designation characteristics, of the 2022 hatchery returns, just 7 females and 1 male were MSW fish. A total of 276 wild and 617 hatchery salmon entered the salmon trapping facility located at the Parteen Regulating Weir fish pass (Figure 3 and Table 3). This trap which is used for collecting broodstock (hatchery salmon are retained for breeding purposes and wild fish are released above the trap), was used from the 3/10/22 and was removed on the 20/12/22.

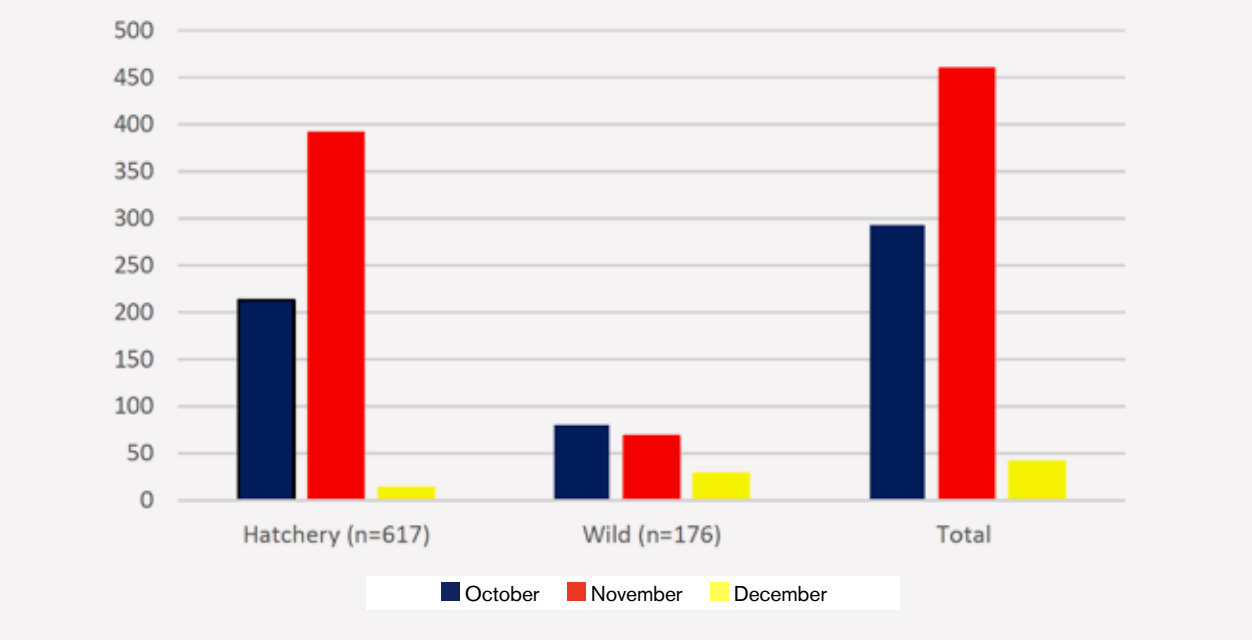


Figure 3. The monthly number of adult salmon removed from the fish pass trap located at Parteen Weir in 2022.

	Wild	Hatchery	Total
October	147	17	164
November	457	231	688
December	13	28	41
	617	**276**	**893**

Table 3. The monthly number of adult salmon either removed from the fish pass trap (hatchery salmon) or else released above the trap (wild salmon) located at Parteen Weir in 2022.

An upstream view of Ardnacrusha station and headrace canal.

Adult Salmon Census for 2022

The number of salmon are assessed entering the Upper Shannon catchment using two automatic infra-red Vaki 'Riverwatcher' units. These are located at the upper exit point of the Borland fish lift in Ardnacrusha generating station and on the Parteen Regulating Weir fish pass. An upstream adult salmon trap is also situated on one of the pools of the Parteen Regulating Weir fish pass which is used to collect ranched hatchery salmon for the period late September to December. During 2022, a service level agreement was entered into with Inland Fisheries Ireland for the ESB fish counter maintenance, service and also the production of census data reports. These are now available on the IFI website.

After technical difficulties of circa two years, the census work commenced upon the Shannon at the two sites. The Ardnacrusha census data began from the 5th July onwards and the Parteen Weir site commenced on the 3rd May. The Parteen Weir located adult salmon trap operated for the period 28th September to the 23rd of December with free passage allowed for all fish before and after this period. The monthly capture of hatchery and wild salmon is shown in Figure 4.

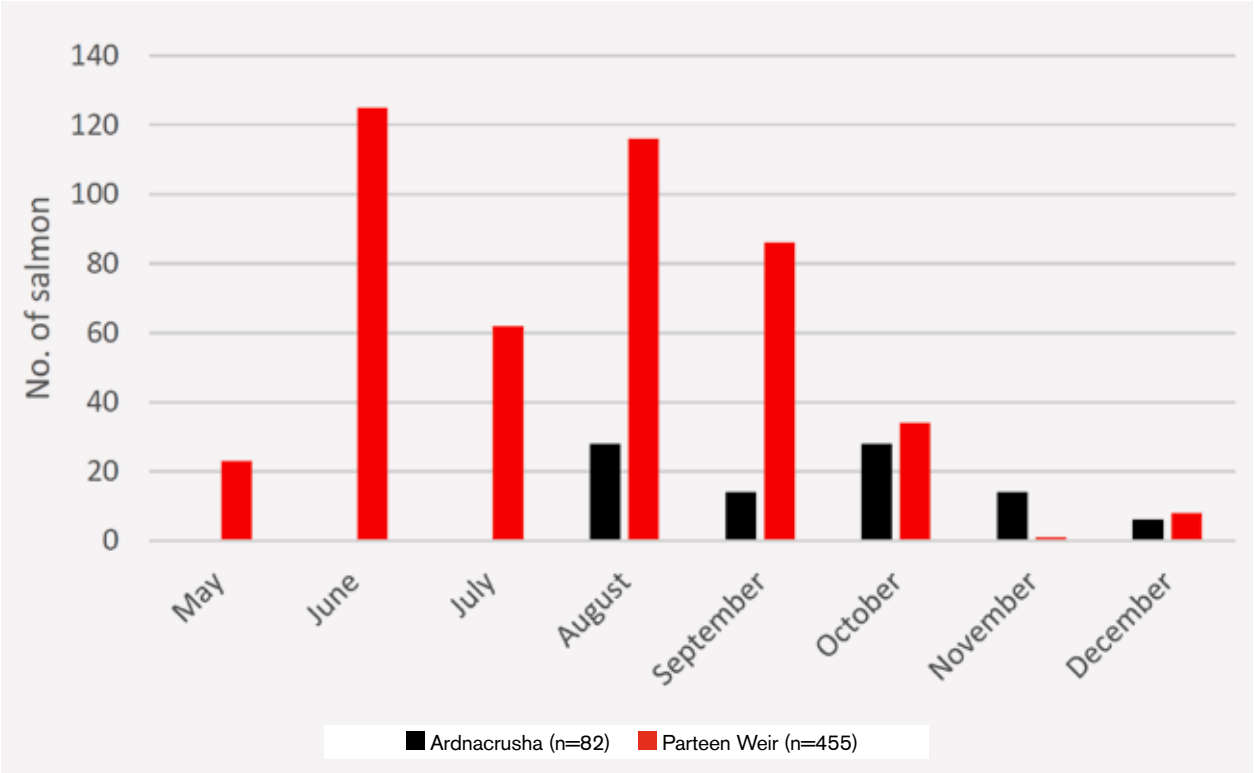


Figure 4. The number of salmon (N=537), that ascended Ardnacrusha fish lift and Parteen Weir fish pass each month during 2022.

Both fish passes operated fully during the year. It should be noted that at present, it appears nationally and internationally as if very low marine smolt survival rates are having a serious negative effect upon Irish salmon populations. A comparison with more recent years is shown in Table 4.

A comparison with more recent years is shown in Table 4

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009#	2010	2011	2012	2013	2014#	2015	2016	2017#	2018	2019	2020	2021	2022
Ardnacrusha Station	190	286	157	433	25	216	102	150	105	62	-	848	523	328	10	385	493	665	1161	638	-	-	379
Parteen Weir	320	343	670	422	563	583	224	589	203	112	706	1011	371	689	457	455	660	210	920	883	-	-	655
Total	**510**	**629**	**827**	**855**	**588**	**799**	**326**	**739**	**308**	**174#**	**706**	**1859**	**894**	**1,017**	**467#**	**840**	**1,153**	**875#**	**2081**	**1521**	**-**	**-**	**1,034**

Table 4. The number of wild salmon ascending the R. Shannon from 2000-2022. Full census data is only available for 2009-2021.
 # The Ardnacrusha census data for 2009, 2014 and 2017 were partial counts or were not counted (2020 and 2021).

The regulating gates at the entry point to the Ardnacrusha headrace canal.

The navigation gate at the entry point from the Ardnacrusha headrace canal into Parteen regulating Weir.

Recreational salmon fisheries of the Shannon

The main salmon recreational fisheries are located on the Old River, between Parteen Weir and Limerick City. The most famous of these is the Castleconnell fishery. Up to 2016, the Lower R. Shannon operated on a catch and release system for all wild salmon, whereas a bag-limit operated for hatchery salmon. For 2022, the River Shannon was open for 'catch and release' of salmon. It was 'open' for trout and coarse fishing.

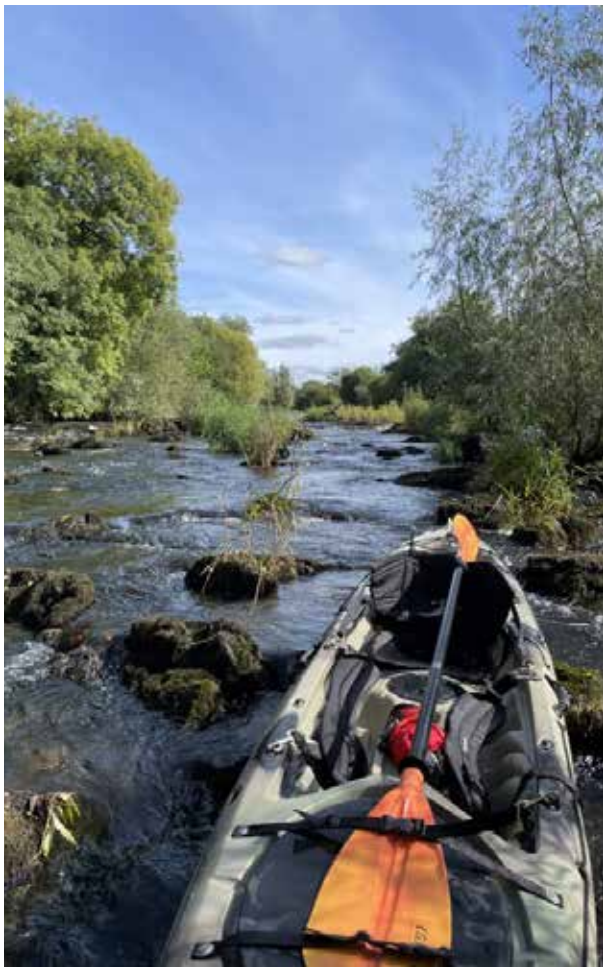
A breach of coarse fish byelaws on the Lower Shannon in 2022.

A view of a section of the Castleconnell Fishery in February 2022.

Fisheries Protection and Regulation

For the 2022 season, Inland Fisheries Ireland (IFI) staff were engaged by ESB Fisheries Conservation to provide fishery protection services on the Lower Shannon and Mulkear Rivers. IFI are also responsible for the Shannon's 'Managed Fisheries' (which include the Suck, Brosna, Little Brosna, Camlin and Inny Catchments). Some on-the-spot fines were issued for minor offences in the fisheries and several nets were seized. IFI staff responded to several calls about illegal fishing and successful prosecutions were taken.

ESB is committed to working with all Government Agencies including An Garda Síochána, Local Authorities, Environmental Protection Agency and the National Parks and Wildlife Service and Angling Groups in seeking to educate and identify those at risk of damaging the fishery environment.



An IFI kayak fisheries protection patrol on the Lower Shannon.

Sea Lamprey observed spawning below Annacotty Weir on the Mulkear and another climbing the weir above Annacotty.

2.2 The River Erne Salmon

Prior to the Erne scheme, the Lower River Erne was famous for its salmon angling and contained an extensive spawning and nursery habitat. The annual numbers of salmon entering the Erne system remained at a high level until the late 1960's, but thereafter fell to lower levels (Figure 5).

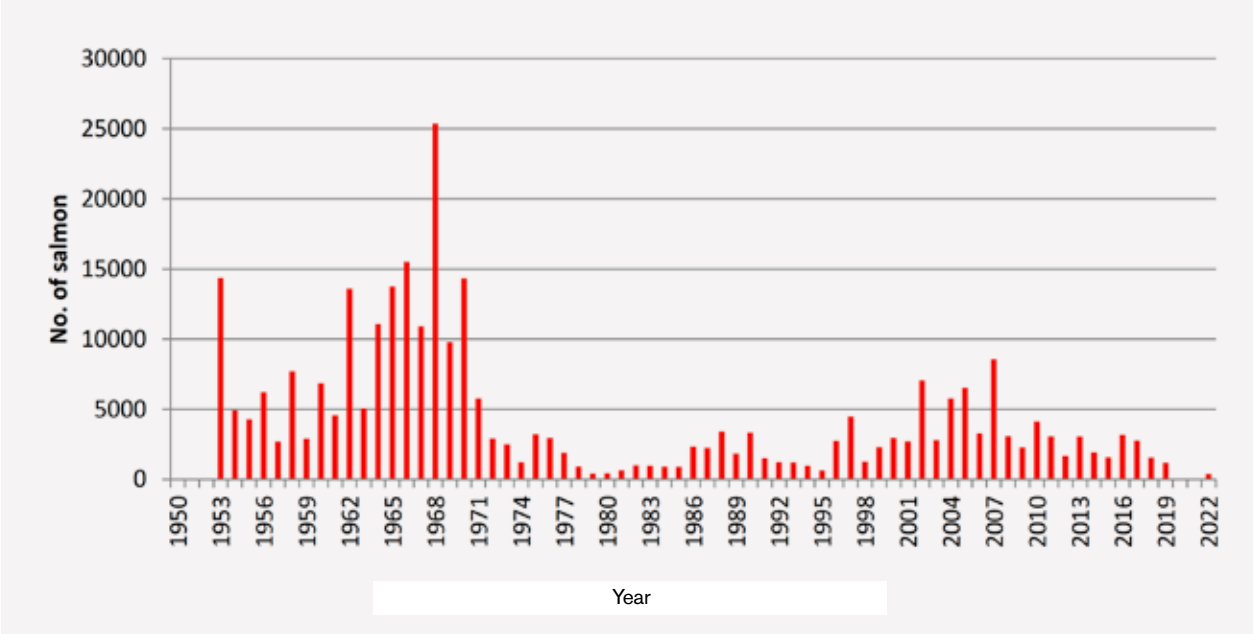


Figure 5. The number of salmon ascending the fish pass at Cathaleen's Fall hydroelectric generating station on the Lower Erne from 1953 to 2022. There was no census data for 2020 and 2021.

Recreational salmon fisheries of the Erne

However, although the Erne scheme caused major changes for salmon in the river, particularly within the lower reaches between Belleek and the sea, the impact of extensive drainage schemes in the middle and upper catchment areas, water regulation and canalisation, intensive farming, afforestation and extensive water pollution have also impacted negatively. Increased marine and coastal exploitation levels since the 1960's followed by the incidence of Ulcerated Dermal Necrosis (UDN), and more recently decreasing marine survival have also added to the reduction in numbers of self- sustaining stocks of salmon.

The River Erne Salmon Management Programme was initiated in 1995. It was a cross border programme set up to address the problem of low salmon runs in the Erne catchment. The programme was funded through European Union Interreg II and was comprised of several partners in Northern Ireland and the Republic Ireland. A list of recommendations was produced by the scientific steering group for the future work necessary to achieve the aim of a self-sustaining wild population of salmon and thus, to establish a high-quality rod fishery. Arising from these recommendations, an ESB Fisheries Work Plan was formulated to list and assess the various areas that ESB is directly involved in.

These areas are:

- The restocking and ranching activities of the Ballyshannon Hatchery.
- Juvenile salmon passage.
- Adult salmon passage.

Ballyshannon Hatchery

Ballyshannon hatchery has been operating since 1983 and is located immediately downstream of Cathaleen's Fall generating station. The water intake for the hatchery is taken at 4.2m depth from Assaroe Lake. Hatchery operations in the past have been affected by poor water quality in the Lower River Erne. The addition of a 'Bermuli' filter and a sand-pressure filter unit to the fish farm and hatchery building unit intake has resulted in greatly improved water quality, thus resulting in the production of higher quality ova, unfed fry and juvenile salmon. The current annual target production for this facility is approx. 1.5 million unfed fry and 50,000 - 60,000 smolts for release into the Erne catchment.

River Erne Breeding Programme and the characteristics of brood fish collected at Ballyshannon during 2022

The current breeding programme at Ballyshannon, utilises Erne ranched salmon and these have been divided into two groups: Grilse and multi sea winter (MSW) salmon. These two lines are held separately, and mating is on a one-to-one basis to ensure genetic diversity. The designation characteristics for returning adults salmon are that females up to 71cm and males up to 84cm are considered to be one sea-winter salmon (1SW) or grilse, whereas salmon larger than these are considered to be multi sea-winter (MSW) salmon. In total 73 female salmon were >71cm and 21 males were > 84cm. A total of 718 hatchery salmon were taken as broodstock in October – December, and of these, 160 pairs of salmon were stripped in 2022.

Production of Ova, Unfed Fry, Parr and Smolt

During 2022, a total of 772,780 juvenile salmon were produced from the 2021 adult salmon broodstock returns. The release locations of these juvenile salmon and the months of release are given in Table 5. A total of 50,295 adipose fin-clipped salmon smolt were released from Ballyshannon hatchery during April 2022.

Month		Stock Stage	Release Catchment	Fish No.
March	Not fin-clipped	Pre-smolt	The Colebrook River (NI)	34,900
April	Not fin-clipped	Pre-smolt	Florencecourt stream (NI)	4,696
			Total	**39,596**
April		Unfed-Fry (grilse x grilse)	The Colebrooke River (ROI)	385,000
April		Unfed-Fry (MSW x grilse)	The Colebrooke River (ROI)	102,000
April		Unfed-Fry (MSW x MSW)	The Colebrooke River (ROI)	6,000
			Total	**493,000**
April	Fin-clipped & microtagged	Smolt (grilse x grilse)	Ballyshannon hatchery	12,016
April	Fin-clipped	Smolt (grilse x grilse)	Ballyshannon hatchery	38,279
			Total	**50,295**
July	Not fin-clipped	Fry	The Colebrooke River (N.I)	75,296
July	Not fin-clipped	Fry	The Arney River (NI)	134,520
			Total	**209,816**

Table 5. Details of the numbers of juvenile salmon and their location of release on the River Erne in 2022.

The Annual Erne Stations Smolt and Elver Generation Protocol

The Erne stations smolt generation protocol involves dusk and dawn generation to near maximum efficiency during the months of April and May and early June. Generation tracks the seasonal cycle of dusk and dawn and begins one hour before and ceases one hour after dusk/dawn. Due to the upward movement of elvers within the Erne estuary, there is no generation in the interim night-time period. For 2022 this continuous generation protocol was always maintained for both Cliff and Cathaleen's Fall generating stations.

Adult Salmon Census and Return Rates

Returning adult salmon numbers are assessed using a 'Vaki Riverwatcher' automatic fish counter. This counter utilises infra-red technology and provides information on fish movements and behaviour of fish within the fish pass at Cliff station. Most salmon tend to ascend the Cliff fish pass towards the evening time. The 2022 census data is shown for previous years in Table 6.

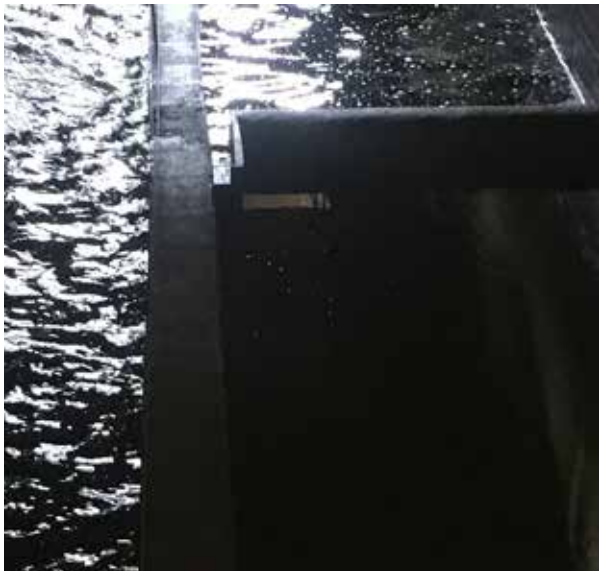
Year	Number of salmon
2022	379
2020 and 2021	No Data
2019	1,184
2018	1,564
2017	2,775
2016	3,174
2015	1,565
2014	1,910
2013	3,038
2012	1,672
2011	2,068
2010	2,284
2009	1,136
2008	2,411
2007	2,962
2006	1,238
2005	1,280
2004	947
2003	849
2002	1,444
2001	475
2000	311

Table 6. The annual census of salmon at ascending the fish pass located at Cliff hydroelectric station on the River Erne for the period 1999-2022. No census data was available for 2020 and 2021.

An upstream adult salmon trap, situated in one of the pools of the Cathaleen's Fall fish pass, is located at Cathaleen's Fall stations. In line with previous years, this trapping facility was only used towards the end of the year (October-December). The reason for the short period of use is to minimise any negative effect to the main wild run of fish (the wild salmon run usually peaks for the months of June/July/August). Thus, it was possible to avoid handling the fresh run wild salmon whilst at the same time ensuring that enough hatchery reared returning salmon were trapped and used for restocking purposes at Ballyshannon hatchery. However, the non-operation of the trap during the early summer period also meant that the 'hatchery' or 'wild' component of the adult census figure could not be fully assessed since the normally operating two Vaki counters do not differentiate between 'hatchery reared' and 'wild' salmon at this site. No blockages within the pools of either Cliff or Cathaleen's Fall fish passes occurred during 2022. Up to the 19th December 2022, a total of 162 salmon (258 hatchery and 2 wild), of were intercepted using the adult salmon trap (Figure 6 and Table 7) located within Cathaleen's Fall fish pass. A further 94 hatchery salmon were taken into the hatchery from above the trap (Table 7 and Figure 6). The fish trap began operation on the 3rd October and ceased on the 19th December. A total of 2 wild salmon were also recorded, but these were released into the pool immediately above the trap (Table 10).

Stripping of adult hatchery broodstock commenced on the 30th November and ended on the 5th January 2023. A total of 156 pairs of salmon were stripped.
From 2004 to present, halogen lights were fitted to the underside of the downstream platform, i.e. the bottom 8 pools of the fish pass. The lights are switched off for the period 12 midnight to 4am. These lights were fitted in an area of poor lighting (which may impede upward fish movement). In addition to these lights, the draft tube gates were removed from this area in 2005, thus allowing natural light to penetrate the entire area. Since then, the significant 'holding-up' of adult salmon within this previously dimly lit area has been eliminated.

During 2022, further genetic sampling of Erne salmon was undertaken using the adult trap facilities located at Cathaleen's Fall fish pass. Sub-samples of both wild and hatchery salmon were sent to University College Cork.



The lowermost section of the Cathaleen's Fall fish pass.

	Salmon within trap				Salmon removed from above trap			
	Hatchery		Wild		Hatchery		Wild	
	Male	Female	Male	Female	Male	Female	Male	Female
September	0	0	0	0	0	0	0	0
October	23	35	0	0	5	13	2	0
November	32	43	0	0	27	23	0	0
December	5	24	0	0	17	9	0	0
Total	**60**	**102**	**0**	**0**	**49**	**45**	**2**	**0**

Table 7. The trapping of hatchery broodstock and wild salmon for the latter end of 2022. All hatchery fish are removed to the hatchery whereas all wild fish are released.

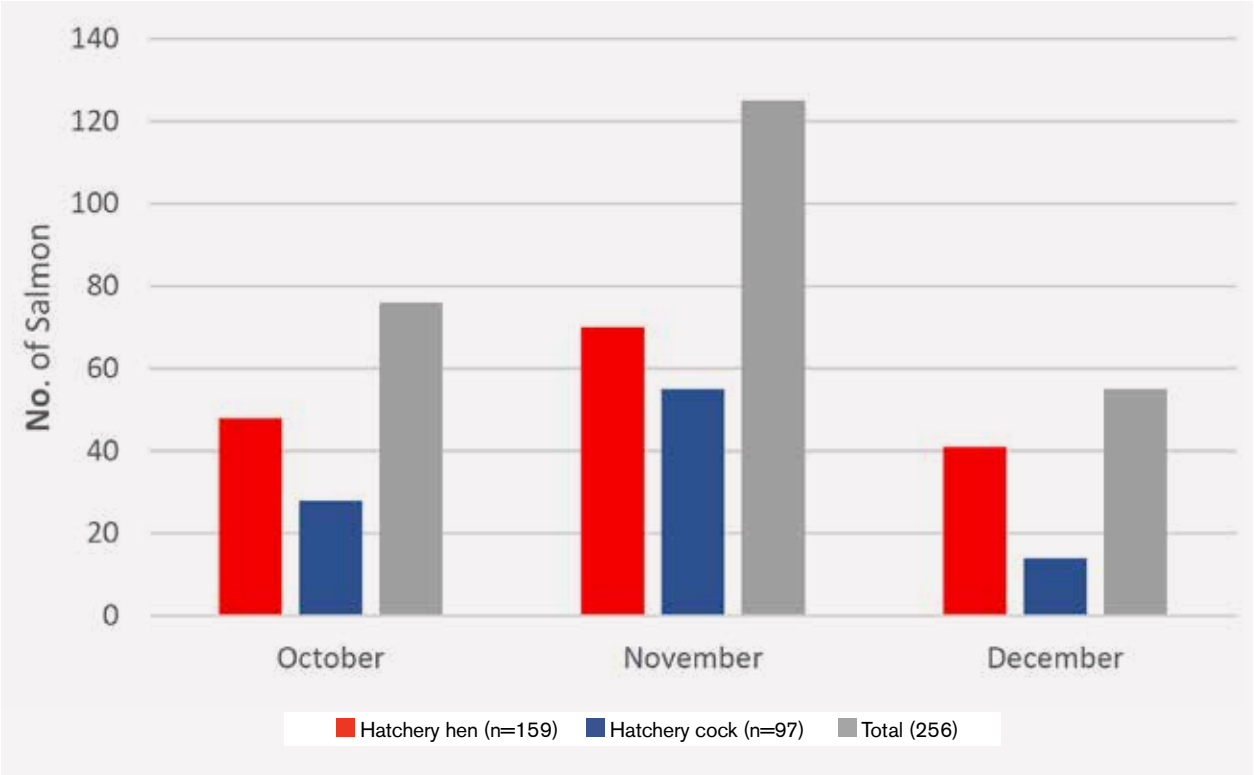


Figure 6. The number of hatchery broodstock taken from within and above the fish trap located at Cathaleen's Fall station fish pass for the latter end of 2022. All hatchery fish are removed to the hatchery as broodstock.

2.3 The Clady and Crolly Salmon

The new stainless-steel frame and fish counter on the upper side of Gweedore Weir.

The stainless-steel inscales and new fish counter frame and scanning unit ready for installation.

The old fish counter chute which holds the fish counter scanning unit at the upper exit point of the Gweedore Weir fish lock.

Salmon and Recreational Angling

Adult salmon ascending the upper Clady River pass through the fish lock located at Gweedore Weir. The census data for 2022 is shown in Table 8 and Figure 7. The Clady and Crolly Rivers were both open as recreational salmon angling fisheries for 2022 under a 'blue tag' system. In some of the previous years, both rivers had operated as catch and release fisheries (C+R), and were lightly fished, most likely due to the C+R status. However, both catchments have always been open for brown trout fishing. Fishing permits were made available at 'O'Donnell's Service Station' and 'An Chuirt Hotel' which is located within either catchment. IFI again supplied an angling boat on the shores of Lough Nacung on the Clady system for visiting anglers to access the lough.

Two seasonal Fisheries Officers were employed on a dual role covering both fisheries protection and development.

Details of their 2022 work is as follows:

Protection

There were good numbers of salmon caught by anglers throughout the season, particularly during freshets and on natural floods, with several salmon in the 6lb weight range taken. Fish were recorded in all sections of the river from Gweedore Bridge to the sea at Bunbeg. In general angler compliance with the wild salmon and sea trout regulations was very high with a total of three Fixed Penalty Notices being issued over the year for angling related offences.

IFI officers carried out regular foot patrols at low water on the Gweedore estuary to ensure no nets were fixed on the main channel. Coastal patrols were carried out from Rannafast Bay to Gweedore Estuary and to Bunaninver Bay in the north. The main aim of these coastal patrols was to detect illegal fixed nets set from the coast which would target salmon and sea trout destined for the Clady and Crolly River systems.

Sea trout caught on the Crolly River after a natural flood in August 2022.

	Salmon			Trout		
	Upward	Downward	Nett Upward	Upward	Downward	Nett Upward
January						
February						
March						
April						
May	0	0	0	1	2	-1
June	71	0	71	13	5	8
July	147	3	144	28	5	23
August	67	26	41	19	4	15
September	54	72	-18	17	3	14
October	0	0	0	0	0	0
November	0	0	0	3	6	-3
December	0	0	0	0	2	-2
Total	**339**	**101**	**238**	**81**	**27**	**54**

Table 8. The salmon and sea trout census data from the Vaki Riverwatcher located on the Clady River at Gweedore Weir.

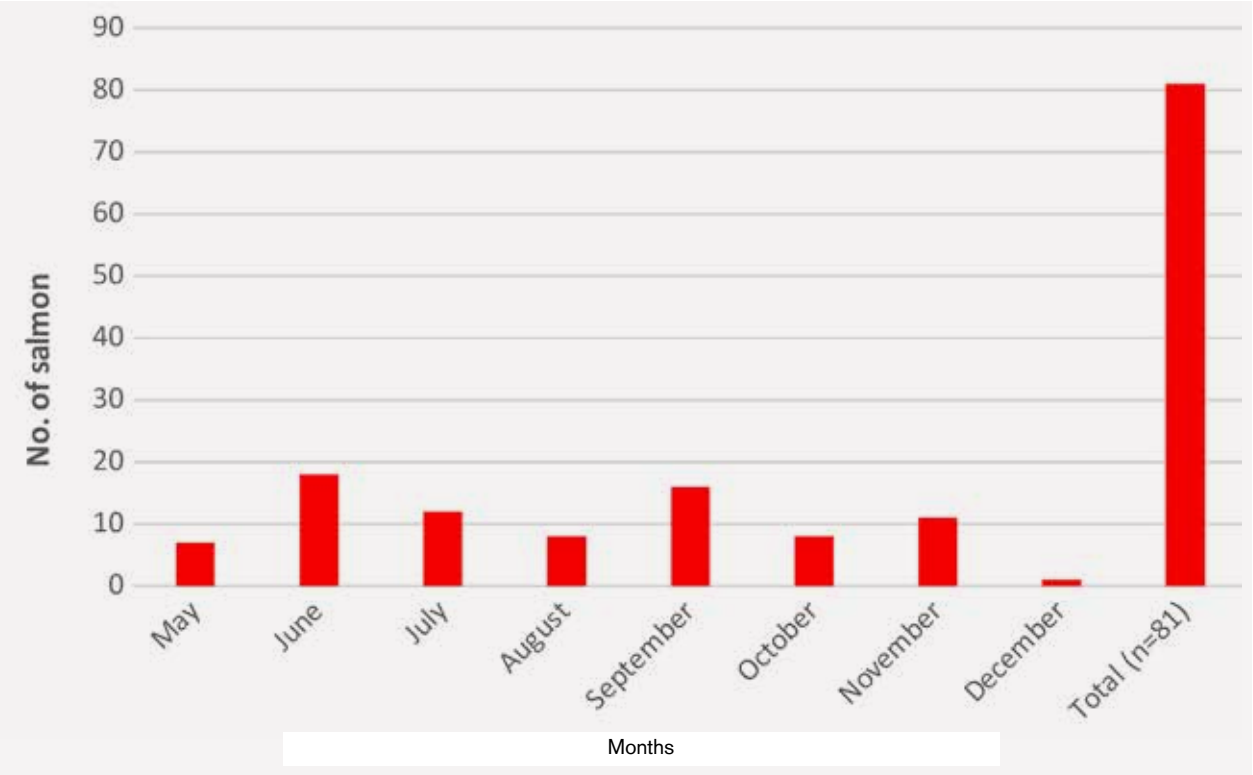


Figure 7. The 2022 monthly census data for the Clady River salmon.

A summer freshet being discharged through Gweedore Weir on the Clady River.

A view of the River Clady.

The 'Flag Rock' falls on the Crolly River.

A view of a section of the Crolly River.

A view of the Clady station headrace canal

A view of the Clady River above Gweedore Weir.

2.4 The River Liffey Salmon

Salmon entering the upper Liffey need only ascend the fish pass at Leixlip generating station, as only this station lies in the path of these migrating fish.

The fish counting facilitates at Leixlip station were removed in 2019 due to Marine Institute operational reductions and it was planned that there would be no fish census activity at this site for future years. However, ESB initiated a fish counting service level agreement with Inland Fisheries Ireland from 2022 onwards. The fish counter is sited on the upper end of the fish lift at Leixlip hydro station. It is a 'Logie' resistivity type counter with one channel covering the width of the fish lift chute and provides a full count of salmon that pass up-river past this point of the river. The current configuration includes a desktop computer with Geovision DVR card and two cameras which provides verification for the fish count.

The recent annual numbers of salmon show that 81 salmon ascended the fish pass at Leixlip from May 11th onwards (Figure 8). This indicates that the fishery installation (fish pass and spillway gates), are working satisfactorily and that sufficient numbers of smolts are not using the Kaplan turbine as a downstream route. However, the census figure of 81 salmon is the lowest on record, but no census data was available until May 11th onwards.

Leixlip reservoir.

Water spilling into the upper entry point of the Leixlip station Borland fish lock, during the 2022 salmon smolt and elver generation protocol.

Water spillage through the 'trash flap' gate at Leixlip station as part of the 2022 smolt generation protocol.

During the annual smolt season (mid-March to mid-June 2022), a salmon smolt and elver generation protocol was implemented which allows for the continuous spilling of surface water through a spillway gate and through the fish lift located at the station.

Recreational fisheries of the River Liffey

Although owned and managed by ESB, Poulaphouca reservoir is currently leased to the Dublin Trout Anglers Association. The fishery, located at Blessington, Co. Wicklow, is a mixed one and there is provision of easy access points and car parking facilities. During 2022, a total of 4,500 yearling trout were released on a monthly basis into Poulaphouca. In addition to these released fish, the survivors of stockings in previous years were also captured during 2022. There were reports of good catches of wild fish during the months of June, but low water levels impacted fishing during the later months. Fishing was also good upon Poulaphouca reservoir, but low water levels impacted fishing during the later months. Poor pike fishing was reported at both sites which was similar to previous years.

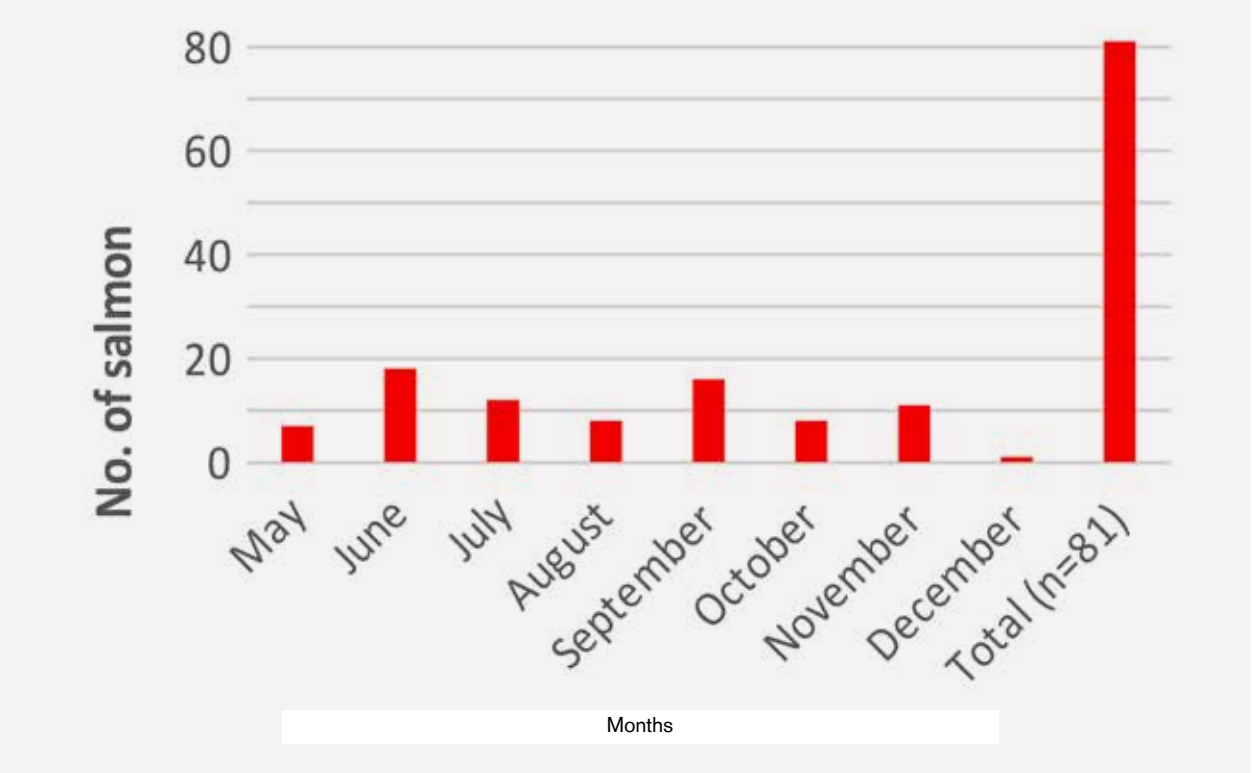


Figure 8. The monthly census data of the Leixlip fish counter for 2022.

2.5 The River Lee Salmon

Initiated in 1994, the River Lee Management Programme aims to assess the status of salmon populations in the catchment, with a view to managing stocks at acceptable levels of abundance. Prior to the hydroelectric scheme, important salmon fisheries existed in the lower and middle reaches of the river and salmon are believed to have spawned throughout the catchment. The impact of the scheme was immediate and was related to water quality (large quantities of decomposing vegetation causing deoxygenation), discharging to the lower river from the newly flooding reservoirs upstream of Carrigadrohid and Iniscarra. Within five years of construction the River Lee stock of salmon had collapsed.

To mitigate this problem, large numbers of fingerling salmon of River Shannon origin were stocked out into the area above Carrigadrohid dam. The results obtained from smolt traps on the Borland-MacDonald fish-locks during the 1960's indicated that the smolt output was poor, and as a result, the area downstream of Carrigadrohid was concentrated upon for restocking purposes. Carrigadrohid hatchery was established in 1956 as a smolt producing facility with the objective of releasing smolt and lower mode parr downstream of Iniscarra dam. Reared smolt were adipose fin clipped in selected years and it was determined that virtually all adults returning to Iniscarra were of hatchery origin. Since 1993, all reared smolt have been adipose fin-clipped and selected lines have also been coded wire tagged. This has facilitated the separation of reared and wild adult salmon.

An electric fishing survey, carried out in 1993, indicated that naturally spawned juvenile salmon occurred at all sites sampled below Iniscarra and at satisfactory densities. However, upstream of Iniscarra, juvenile salmon were present only at sites close to the reservoirs. These sites were surveyed again in 2001, 2003, 2005 and 2009 and the results were similar to the 1993 survey in that a very healthy salmon population predominated below Iniscarra station, whereas only isolated populations were to be above the stations (largely as a result of restocking efforts).

The area above the two stations has been annually restocked with juvenile salmon and, in addition, a smolt generation protocol has been introduced to facilitate downward smolt migration. This smolt generation protocol involves the continuous spilling of water through the Borland-MacDonald fish-lock at Iniscarra, coupled with a cessation of night-time generation during the months of April and May. Depending upon the availability of water, a continuous generation protocol was maintained at Carrigadrohid during April, May and early June 2022.

Carrigadrohid hatchery

Carrigadrohid hatchery was officially opened in 1956 and extended in 1970. It is located immediately downstream of Carrigadrohid generating station. The annual target production is 1 million unfed fry and 50,000 smolts for release into the Lee catchment. There is no commercial aquaculture activity in the hatchery unit.

Production of ova, unfed fry, parr and smolt

A total of 45 pairs of salmon were stripped in December 2022. The progeny of these fertilised eggs (n=93,900 fertilised ova) will be either retained within the hatchery for on-rearing or released as juvenile salmon into the Upper Lee in 2023. A total of 69,762 fin-clipped salmon smolts were released into the lower reaches of the Lee in during the period 14th-22nd March 2022 (Table 9). The release site is Iniscarra cemetery located below Iniscarra station.

Smolt	Location of release	Month	Number released
Lee	Below Iniscarra station	March 14th - 22nd	69,762 (including 12,436 micro-tagged)

Table 9. The number of juvenile salmon (smolts) released from Carrigadrohid hatchery in 2022.

A section of the Lower River Lee.

The inscales used for returning stray hatchery salmon that enter the salmon hatchery located below Carrigadrohid salmon hatchery.

Lee generating protocol to assist smolt migration

A night-time generating protocol was implemented at Carrigadrohid generating station during the months of April, May and June for the 2022 smolt season. As in previous years, water was discharged continuously (approximately $3m^3sec^{-1}$), through the fish-locks in order to encourage smolts to descend via this route. No night-time generation is undertaken at Iniscarra, except when necessary during flood episodes. High discharges are maintained on the lower River Lee immediately after the releases of the adipose fin-clipped reared smolts to assist smolt migration.

Performance of the River Lee Recreational Salmon Fisheries in 2022

At the ESB Iniscarra fishery, the declared minimum catch was 82 salmon. Previous years catches are shown in Table 10. Of the 82 rod captured salmon in 2022, 57.3% were wild salmon, the remainder being hatchery adipose fin-clipped salmon The weight of the catches ranged from 4lbs to 12.5lbs. The monthly distribution of the declared rod catch is shown in Table 10 and Figure 9. Due to drought conditions in the summer the catches declined as did the fishing effort and was therefore atypical when compared to previous years.

Year	Rod Catch
2022	82
2021	55
2020	88
2019	29
2018	30
2017	72
2016	62
2015	35
2014	128
2013	78
2012	302
2011	200
2010	218
2009	372
2008	131
2007	574
2006	227

Table 10. The performance of the Iniscarra salmon rod fishery during 2006 – 2022.

	Wild	Hatchery	Total
April	12	3	15
May	7	14	21
June	12	17	29
July	2	7	9
August	2	5	7
September	0	1	1
	35	**47**	**82**

Table 11. The monthly distribution of rod captured salmon, (n=82) on the ESB owned Iniscarra fishery for 2022.

The ESB owned section of the Lee fishery located downstream of Iniscarra station fished poorly in the beginning of the season with catches rising slightly towards season end. This was despite the large numbers of anglers present on the fishery particularly early morning and during evenings. 'Catch and release' of salmon was commonly practiced by many anglers and the routine checking of permits by ESB and IFI staff helped with the management of the fishery. The largest salmon recorded on the Iniscarra fishery was caught in early June and was 12.5lbs weight (wild origin). The weight distribution of salmon captured at the Iniscarra fishery is shown in Figure 17.

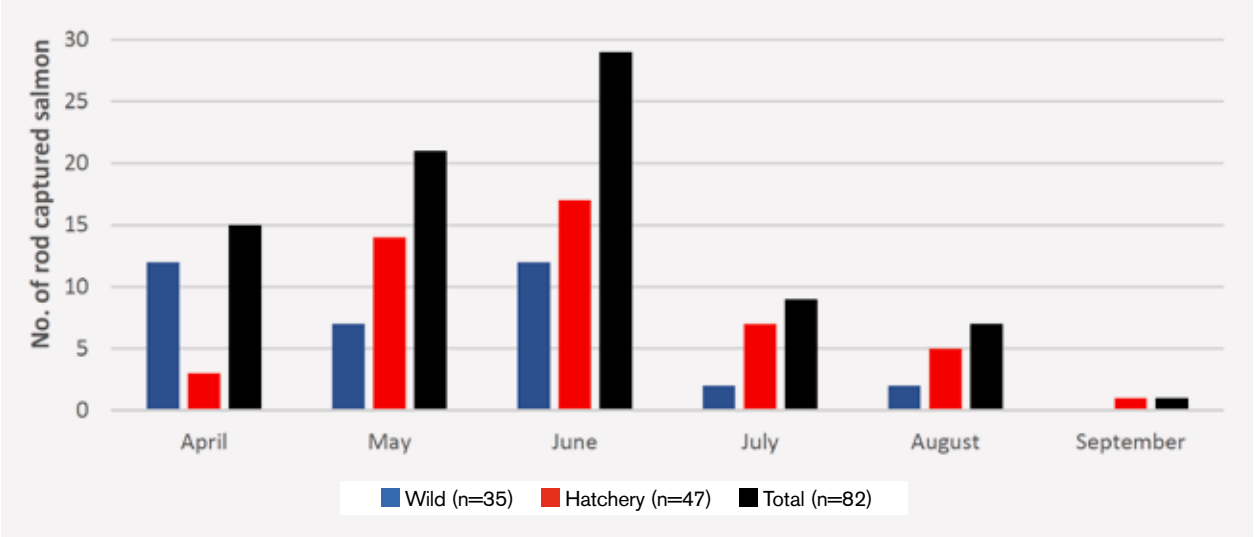


Figure 9. The 2022 monthly capture of hatchery and wild salmon on the Iniscarra angling fishery.

Salmon census at Iniscarra Generating Station

The automatic fish counting system is situated at the upper exit of the Borland-MacDonald fish lift located at Iniscarra station. However, due to continuous malfunctions of the fish counter there was no census data for 2022.

The operation of the fish lock was continuous for the year and adult trap began operation on the 11th September and ended on the 13th December 2022. Flood conditions on the Lee, with both full generation and spillage, effectively ended the salmon run in late November. All ascending hatchery salmon (n=124) were removed from the upper chamber of the fish-lock and transferred to Carrigadrohid hatchery. All wild salmon (n=21) were immediately released above Iniscarra station. The monthly capture of salmon is shown in Figure 10 and Table 12. All adipose fin-clipped or reared salmon were removed and retained at Carrigadrohid hatchery for breeding purposes. The stripping programme ended on the 15th December and ended on the 31st December. In total 45 pairs were successfully stripped and a small number of fish which remained unripe in late December 2022, were released early in 2023 at Coolea in the Upper River Lee. All stripped hatchery fish (which were not micro-tagged), were released at Iniscarra cemetery which is located below Iniscarra station.

The stripping of the broodstock resulted in a total of 93,900 fertilised ova.

	Hatchery (n=124)		Wild (n=21)		
	Male	Female	Male	Female	Total
September	0	0	0	0	0
October	0	0	0	0	0
November	71	53	16	15	144
December	0	0	0	0	0
	71	**53**	**16**	**15**	**144**

Table 12. The 2022 monthly capture of hatchery and wild salmon in the Iniscarra station adult salmon trap.

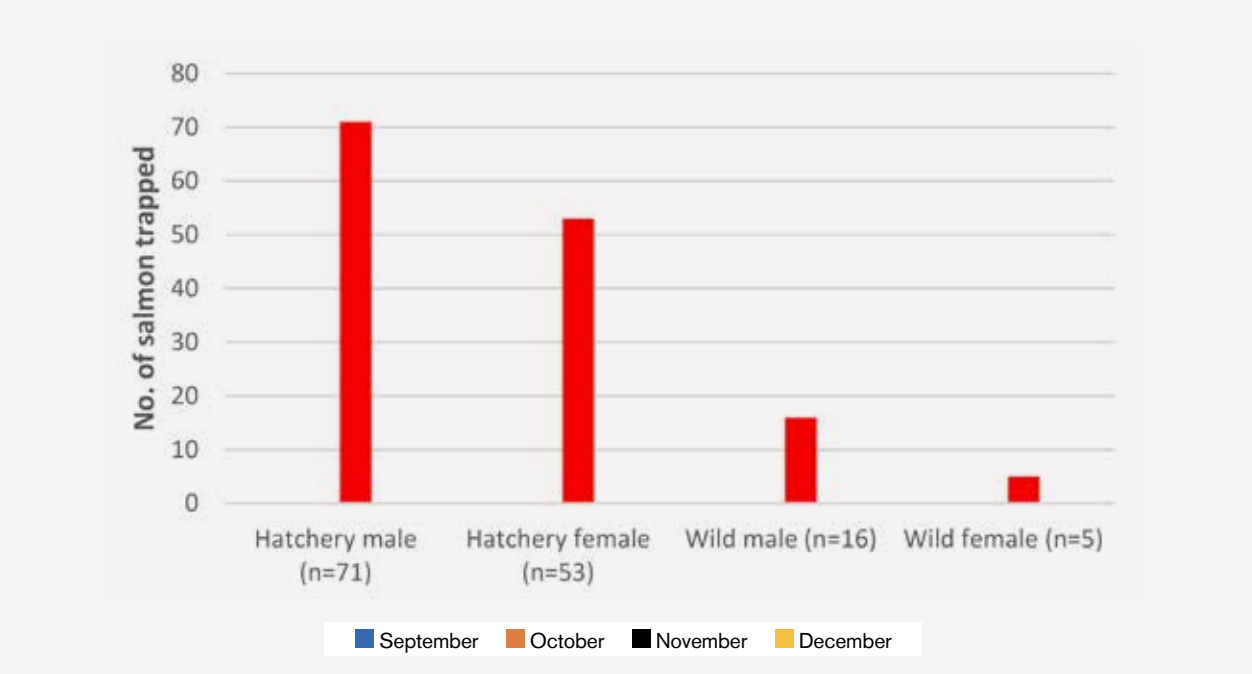


Figure 10. The 2022 monthly capture of hatchery (n=124) and wild (n=21) salmon in the Iniscarra station salmon trap.

Characteristics of reared and wild salmon collected at Iniscarra

Of the 124 reared salmon transferred to the hatchery in 2022, none designated as MSW fish. All wild returning salmon (n=21) trapped in 2022 were immediately released above Iniscarra station. Both MSW and grilse designation characteristics are used for Carrigadrohid, Parteen and Ballyshannon hatcheries. The designation characteristics are that females up to 71cm and males up to 84cm are considered to be one sea-winter (1SW) or grilse, whereas salmon larger than these are considered to be MSW salmon.

Chapter 3. Habitat Enhancement Work

The specific areas of the Shannon catchment which have been selected for habitat restoration works, are those catchments which have been previously drained and which presently suffer from having a homogenous canalised type of habitat, with a capacity of supporting a limited number of fish species and life stages. The list of sites to be worked upon is also reviewed by the Shannon Fisheries Partnership Group which is a partnership arrangement made up of ESB Fisheries Conservation, Inland Fisheries Ireland (IFI) and the Shannon Fisheries Development Company.

The catchments worked upon in 2022 included:

1. The Mulkear (Lower Shannon).
2. McNamara's Lake (Lower Shannon).
3. Castleconnell (Lower Shannon).
4. The Nenagh River (Ollatrim tributary).
5. The Little Brosna (Camcor tributary)
6. The Ballyfinboy River
7. The Breensford River.
8. Lecarrow River
9. Hind River
10. Cross River

Appropriate Assessments (AA) are carried out, the need for which originates from Article 6(3) of the EU Habitats Directive (Directive 92/43/ EEC). This considers whether a plan or project, alone or together with other plans and projects, is likely to have significant effects on any European Sites. This is in view of best scientific knowledge and the conservation objectives of the respective sites. European Sites are those identified as sites of European Community importance designated as Special Areas of Conservation (SAC) under the Habitats Directive or as Special Protection Areas (SPA) under the Birds Directive.

The first step of the AA process is to carry out a Screening for AA to establish whether, in relation to a particular plan or project, an AA is required. Article 6(3) states "Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.

The provisions of the Habitats Directive have been integrated into the Planning and Development Act 2000 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended). In accordance with the aforementioned legislation, ESB Fisheries undertakes Screening for Appropriate Assessment (AA) to assess, in view of best scientific knowledge and the respective conservation objectives for relevant European sites, if proposed works or activities, individually or in combination with other plans or projects would be likely to have significant effects on any European sites.

Each specific site work plan is drafted by IFI staff working in a partnership approach with ESB Fisheries Conservation staff. Where appropriate, the Office of Public Works (OPW) and the National Parks and Wildlife Service (NPWS) are notified of these works and a screening report for an Appropriate Assessment document is completed. Permission for access to the individual work sites are also requested from the local landowners and with the co-operation of the local angling clubs and other recreational riverine users.
Due to some of the selected areas having undergone arterial drainage during the past few decades, the individual plans aim to change the physical habitat from a drained homogeneous area towards re-creating a naturally heterogeneous habitat. Therefore, many stages of fish will be able to inhabit the newly formed areas and many species of fish will be able to populate a given stretch of river. All the areas being worked upon have a favourable water quality status to ensure the survival of the various fish population both during and after the habitat works.

The habitat work programme may be categorised into two different areas:

(1) Instream work: This work involves the recreation of the riffle-glide-pool sequence that would normally be representative of a healthy un-drained river. However, in many drained rivers this riffle-glide-pool sequence has been removed as part of the drainage process and the bed of the river has been altered and/or lowered. Thus, a homogeneous or 'canalised' river is what remains

after the drainage work, which is unsuitable for a naturally balanced fish population. In general, the number of fish species occupying an area, and the number of individual fish is greatly increased if a variety of habitats are present. Instream works includes building stone vortex weirs and alternating deflector placement of random boulders, spawning gravels and rock armor bank protection. The timing of the works is especially important as spawning fish may be present during the late autumn to late spring months. Therefore, all instream works are scheduled for the period May to mid- September. The flood conveyancing capacity of each the rivers remains unaffected, as all in-river structures are designed and built to be submerged in high flow conditions without any damage to the structure or riverbank.

(2) Riparian/bank side work: This work is carried out during the winter months as tree pruning is prohibited under law during the bird nesting season. Works include the removal of excess overhanging vegetation, where it causes excessive shade or 'tunnelling' of the river. Excessive tunnelling by riverbank vegetation prevents light entering the river and thereby reduces the instream productivity. An example of this would be that aquatic plants would be absent where excess riverbank shade exists. Their absence would decrease the source of food for aquatic insects and there would also be a reduction in the amount instream cover available for resident fish to hide and develop individual territories when necessary.

The final task would be to fence the riverbank areas with post and wire, although provision is occasionally made for cattle drinking areas (depending upon land use and the landowner's view). Cattle drinking areas aim to provide restricted access to the river (within a discrete area), whilst preventing cattle trampling an entire river ban area, which thereby may cause later erosion. Provision is made for access to the river by footpaths, gates, footbridges, styles etc., but only after the prior permission of the landowner. Fencing is to the farming 'Acres' scheme standard where required.

ESB habitat works completed during 2022

ESB habitat works were completed at several locations during 2022. The following sections shows a selection of photographs which along with some text helps to explain the wide variety, scale and quality or the work completed by ESB fisheries staff. Where works were either uncompleted or partially completed in 2022 (due to unplanned changes such as the weather (rainfall/river discharges) or prioritisation of other ESB work, or where the progress of these works be slower than planned, these sites will be completed in 2023.

Mulkear

During 2022, routine maintenance of existing structures was carried out on the Mulkear. This included clearing footpaths and completing some extensive repairs to previously constructed angling access points. A swing gate along with upgrading signage were also completed.

McNamara's Lake

McNamara's Lake has been extensively upgraded by ESB staff over the past decade. The 2022 work programme included general maintenance of the area and the erection of new signage were needed.

Castleconnell

Angling access works were completed throughout Castleconnell during 2022. Work was carried out along the riverbanks where some selective clearance was undertaken. The spraying of emerging Giant Hogweed with glyphosate was undertaken by the Castleconnell Fishery Association (CFA). Giant hogweed is one of the first plants to emerges and in 2022 the CFA had persons (courtesy of the Castleconnell CE scheme), committed to the program for the months of April and May. The best return from this selective spraying is during the early months before other growth catches up. Volunteers from the CFA also 'adopted' a stretch of river to identify straggler plants and spray them in later months. Around June/July the CFA sprayed the other highly invasive non-native plant, the Himalayan Balsam, which was present but not as pervasive. This was mainly done at the bottom of the fishery (Beats 5 and 6).

IFI staff completed repairs to angling infrastructure within the Castleconnell area in 2022.

Damage from an oil spill reported on the 3rd of January on the Castleconnell fishery.

IFI repairs to a fishing stand located at the Pumphouse, Castleconnell.

Nenagh River

During 2022 public access works were carried out by an ESB contractor along a short stretch of the Nenagh River, Tipperary. This section of the Ollatrim River was re-fenced and new swing gates erected. Selective pruning was also carried out.

The Little Brosna (Camcor River)

During 2022, two areas near Birr town were worked upon. The first of these was upstream of Birr town where rock armour and some fencing were added to a section of riverbank that had been eroded.

Rock armour along a short section of riverbank and new fencing erected.

An ESB Fisheries tracked machine working on the banks of the Camcor River.

New fencing alongside a footpath on the banks of the Camcor River.

New fencing alongside a footpath on the banks of the Camcor River.

The second section of river worked upon was at Clareen where there was re-instatement of rock armour along with erection of fencing and swing gates along a riverside footpath.

The Ballyfinboy River

A section of the Ballyfinboy River in Co. Tipperary was worked upon in 2022. The works included rock armour for badly eroded riverbanks, removal of largescale blockages of deadwood and in river trees, the provision of cattle drinking areas (rather than full access for livestock to the river. Random boulders were placed in the previous homogeneous channel to provide cover for fish and help for the creation of territories. The final task was the provision of livestock fencing to the ACRES standard.

A short section of rack armour being built on the Ballyfinboy River.

A short section of rock armour being built on the Ballyfinboy River.

A short section of rock armour being built on the Ballyfinboy River.

Newly erected fencing long the banks of the Ballyfinboy River.

Ground being levelled and the refilling of the riverbank after the placement of bankside rock armour.

A random boulder placed into the Ballyfinboy River.

Vegetation growing along the banks of the Ballyfinboy River.

Selective removal of willow trees along the Ballyfinboy River.

Areas of the Ballyfinboy River where large instream blockage shown were removed.

Stone fill being used for the creation of a livestock drinking area.

A newly built livestock drinking area and the selective removal of willow tree vegetation on the Ballyfinboy River.

A large instream partial blockage on the Ballyfinboy River.

A random boulder being placed into the Ballyfinboy River.

The Breensford River

During 2022, ESB staff carried out instream and bankside work along a section of the Breensford River. The bankside work programme included selective removal of bankside trees and the strimming and general maintenance of the existing access pathways. The selective clearance of shrubbery and trees allows for access by anglers and the general public, whilst also allowing natural light to enter the river.

A selection of sites on the Breensford River where selective clearance of bankside vegetation is required.

A site were a livestock access point for drinking water is required.

A site were random boulders and a stone weir and scour pool is required.

The Clady and Crolly Rivers

During 2022, Inland fisheries Ireland (IFI) staff carried out maintenance of prior work completed along the Clady and Crolly Rivers. IFI Fisheries Officers carried out regular bank clearance and access improvements initiatives along both rivers. This included strimming and general maintenance of existing access pathways and selective clearance of shrubbery and trees to allow access for anglers and excessive shading of the river. Both officers worked closely with the local Crolly Angling Club and Údarás to carry out extensive access maintenance along the entire length of the Crolly River.

Selective clearance of bankside shrubbery on the Clady River.

Replacement of a handrail on the Iron Bridge Clady

A strimmed walkway on the Clady River.

Construction of a new walkway on the Crolly River

The Lecarrow River

During 2022, ESB staff carried out habitat enhancement work on the Lecarrow River in Co. Roscommon. This work included bankside work such as the provision of public access and associated fencing.

The provision of a fence along a footpath along the banks of the Lecarrow River.

The Hind River

During 2022, ESB staff carried out habitat enhancement work on the Hind River in Co. Roscommon. This work included instream and bankside work.

The provision of a cattle crossing point over a tributary of the River Hind.

The provision of a cattle crossing point over a tributary of the River Hind.

Cattle slats being lifted into place and concrete being poured to form a bridge.

Cattle slats being lifted into place and concrete being poured to form a bridge.

Clearance of a heavily tunnelled stream on the River Hind system.

The Cross River

During 2022, ESB staff carried out public access work on the Cross River in Co. Roscommon. This work included the provision of access points, footpaths stiles and bridges.

A footbridge and a swing gate on the Cross River.

A public access point on the Cross River.

Chapter 4. The European Eel

4.1 The River Shannon Eel

An evening view of the Killaloe Eel Weir on the River Shannon.

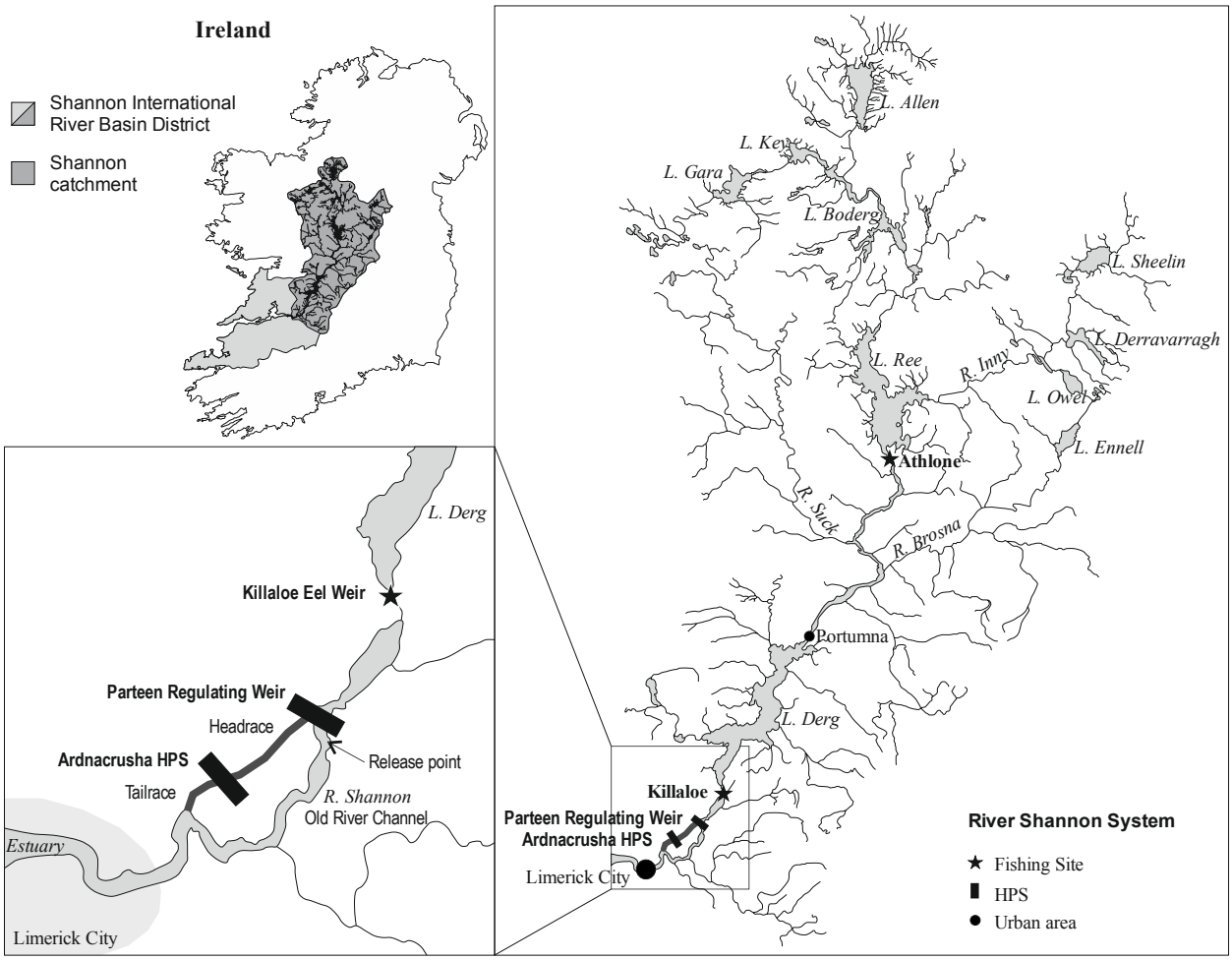


Figure 11. Map of River Shannon catchment with conservation fishing sites, release point and Ardnacrusha HPS indicated.

In 2022/23 season, conservation eel fishing was conducted at three sites: two at Athlone, and one at Killaloe (Figure 12). Fishing began on the last week of August 2022 at Athlone and the 19th October 2022 at Killaloe. Fishing ceased at Athlone on 28th December 2022 but continued at Killaloe until 24th January 2023. A total of 12,912 kg of eels were caught at Athlone (11,878 kg at the Jolly Mariner site and 1,034 kg at the Yacht Club site), and a further 7,017 kg were caught at Killaloe, giving an overall Trap and Transport catch of 19,929 kg (Figure 12). The overall Trap and Transport capture in 2022/23 is comparable with captures from the previous 2 years (Figure 13).

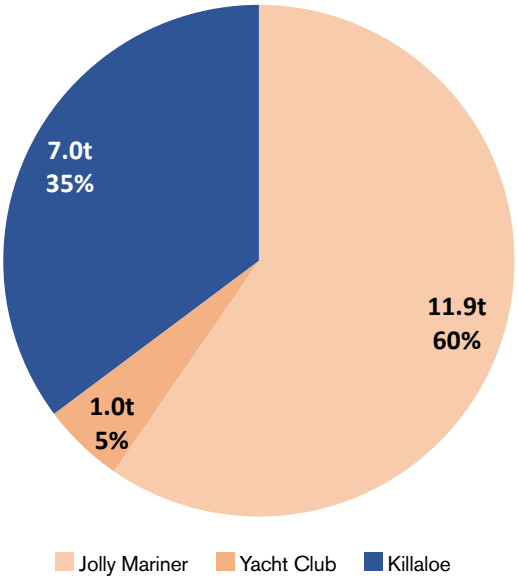


Figure 12. Proportions of the River Shannon Trap and Transport catch obtained by each fishing crew in the 2022/2023 season.

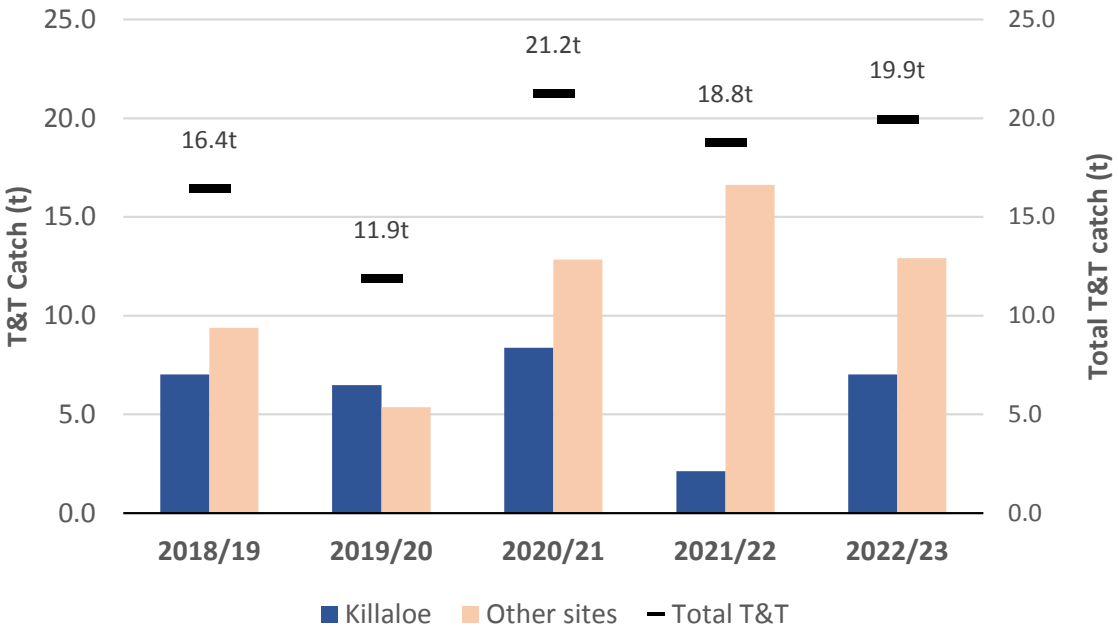


Figure 13. Total Shannon Trap and Transport Program silver eel catches, released in last five years, along with proportion of Killaloe and other sites catch contributions.

Daily catch rates at Killaloe are shown in Figure 14, along with variation in discharge and spillage. Discharge was variable during the season with little spillage. Highest catches were recorded during the last moon quarter in November 2023, and in January, which coincided with a period of relatively high discharge.

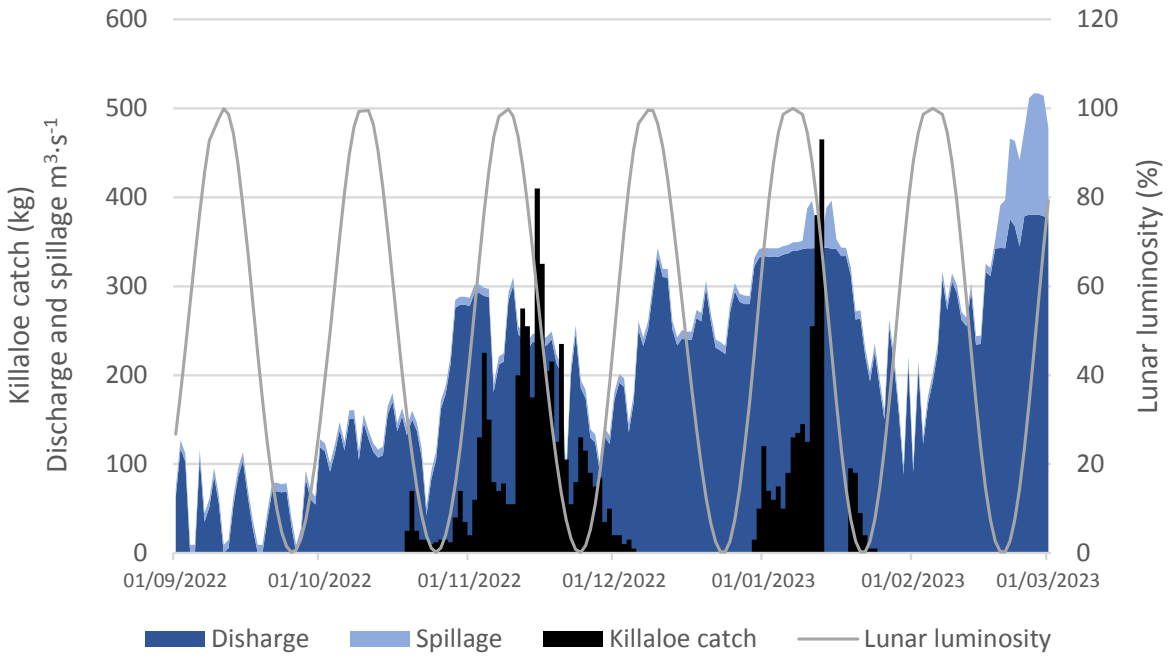


Figure 14. Variation in daily catches at the Killaloe fishing site, in relation to the lunar cycle, discharge and spillage during the 2022/2023 season.

Production and escapement figures for the River Shannon are summarised in the flow diagram (Figure 15). Production of 33,629kg is estimated by the trap and transport catch at Killaloe using the fishing efficiency rate of 29.2%, together with the catch from the two Athlone sites. This fishing efficiency rate at Killaloe is based on Mark-Recapture experiments conducted by the University of Galway from 2016/17 – 2019/20. In total 19,929kg (53.9% of production) was moved beyond the hydropower station through trap and transport. Of the 17,014kg that moved beyond Killaloe weir, it is estimated that 1,344kg (7.9 %) migrated via the Old River Channel. This is determined by the amount of spillage to the Old River Channel, using a regression model based on historical telemetry studies of downstream route selection. An estimated 21.15% mortality (3,314 kg) at Ardnacrusha hydropower station of the 15,670 kg that entered the headrace, leaves 12,356 kg progressing downstream. This gives an escapement of 33,629 kg, or 91.0 % of production.

The estimates of production and escapement as shown in Table 13 and Figure 16, together with trap and transport quantities for the last five years are comparable except for the 2021/22 season, where production was 13 tonnes lower. The value of escapement as a percentage of production remains high, ranging from 86.8% to 95.5%.

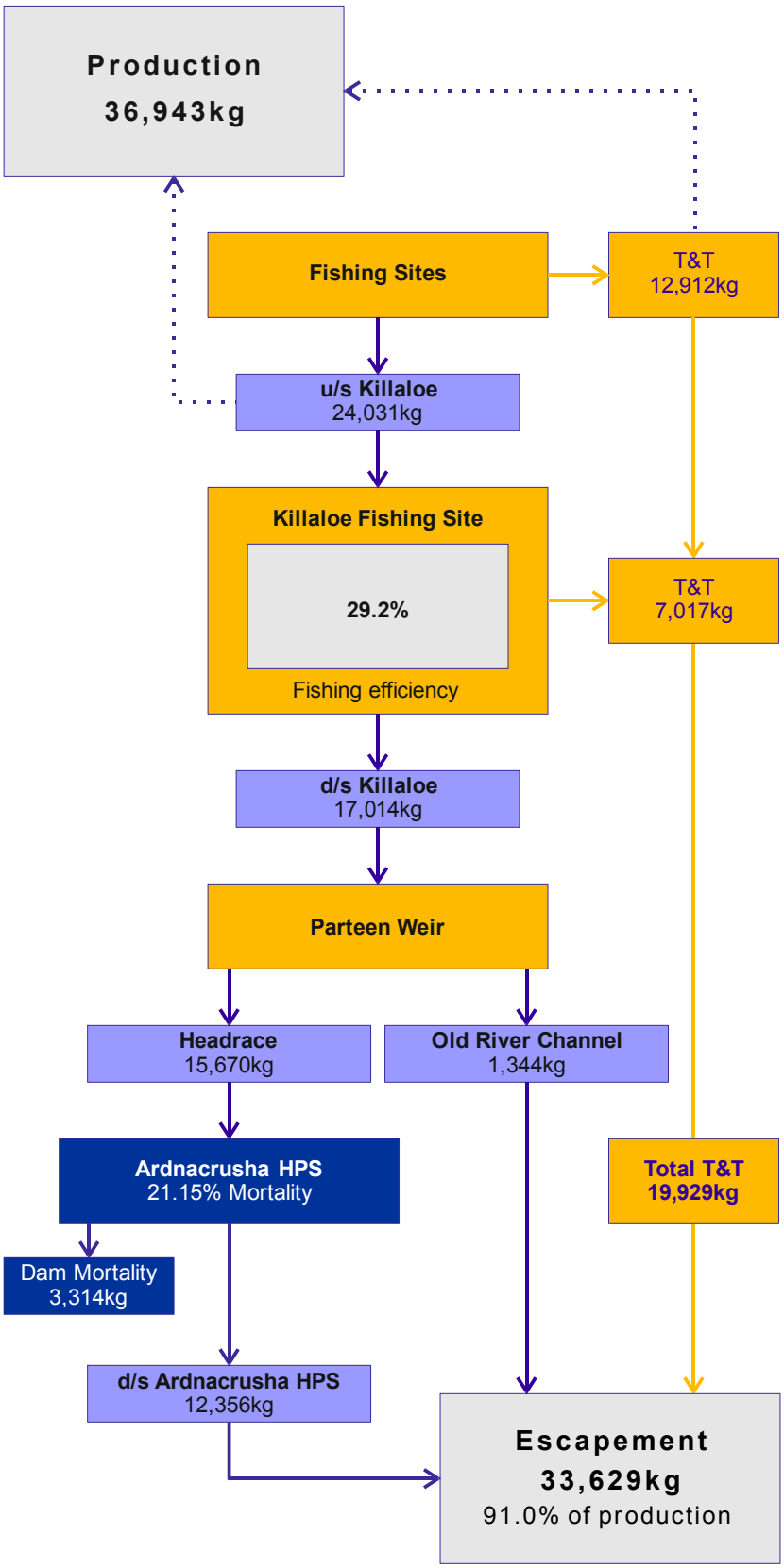


Figure 15. A summary of the analysis of silver eel production and escapement in the River Shannon during the 2022/2023 eel migration season.

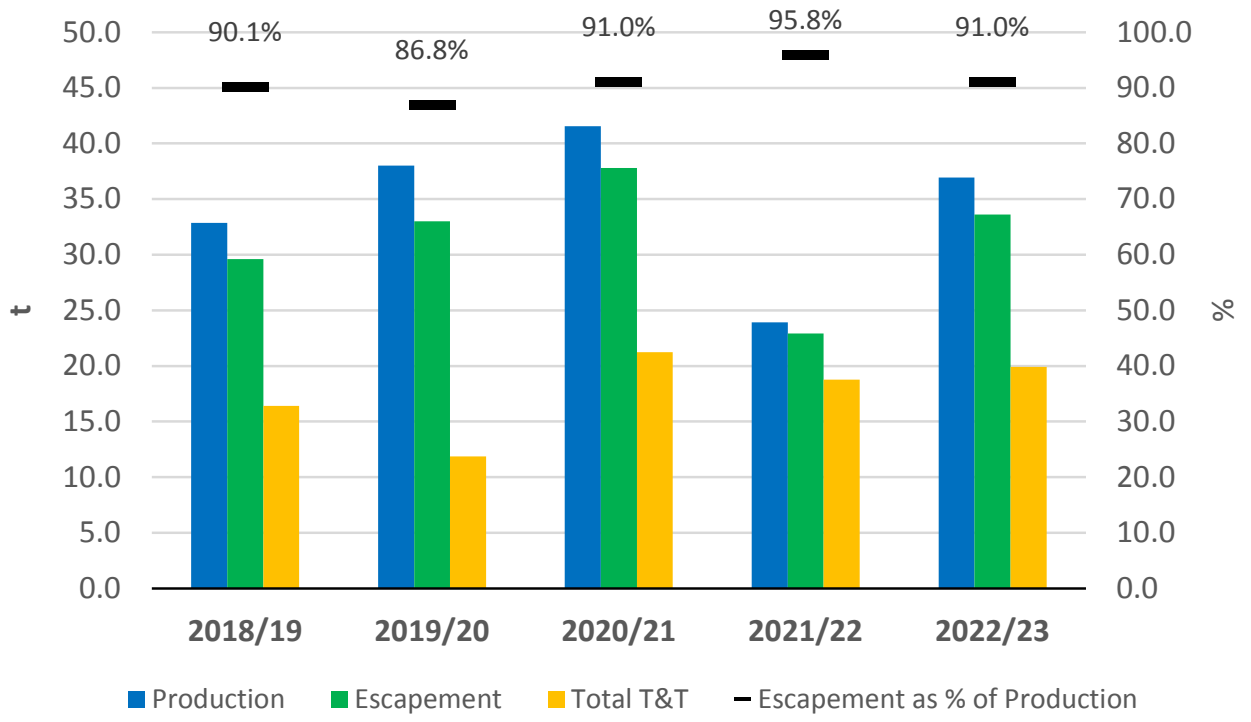


Figure 16. Estimates of production and escapement, together with trap and transport quantities and escapement as a percentage of production values, in the last five seasons..

Year	Production (kg)	Escapement (kg)	% of Production
2022/2023	33,629	33,692	91.0
2021/22	23,903	22902	95.8
2020/21	41,548	37,810	91.0
2019/20	38,028	33,011	86.8
2018/19	32,850	29,613	90.9

Table 13. Production and escapement estimations on the River Shannon in the 2022/2023 season, and corresponding values for the previous four seasons.

Shannon Eel Stock Enhancement

ESB have been capturing upward migrating juvenile eel at several Lower Shannon locations for many decades. In recent times, efforts have been concentrated at Ardnacrusha station and Parteen Regulating Weir. The three Parteen Regulating Weir and three Ardnacrusha located juvenile eel traps were put into service on the 16th March 2022.

Fishing activity ceased at all sites on the 12th September. A total catch of 656.43kg were captured and transported during 2022 (Table 14). This compares to a total of 102.4kg, 1,172.6kg, 13.4kg and 1,402.5kg for 2021, 2020, 2019 and 2018. The catches of juvenile eel (96.7kg) at Parteen Regulating Weir were a mixed catch of fingerling eel and elver. All catches of juvenile eel are released into the Shannon catchment above Ardnacrusha station and Parteen Weir. The results of the 2022 elver catches again show the Shannon catch to be in decline (along with the European trend). The trapping of juvenile eel will continue in 2023. The Ardnacrusha elver traps have been extensively refurbished over the period 2017-2020. These refurbishments included;

- The provision of increased water supplies at a variety of differing locations to the old Ardnacrusha elver ramp trap. Water from existing discharge points were also diverted and now discharge close to, or onto the ramp area. This increased discharge helps attract juvenile eel to the main trapping area.
- The provision netting at all sites to deter avian predators.
- A walkway was added to allow easy access to the large ramp area. This will also allow regular servicing/maintenance of the site.
- The replacement of the older matt climbing substrate with a new bristle type of matt substrate. These bristle matts are of varying spacing intervals which therefore facilitate juvenile eels of varying length and climbing abilities to access the traps.
- New elver traps were added at two extra locations. These were designed to allow for differing bristle matt spacing sizes to reflect the different sizes/ages of the upward migrating juvenile eel.

	Parteen Weir			Ardnacrusha		
	Old trap (fish pass)	New trap (fish pass)	Middle bank	Large trap	Fish pass trap	Mechanical workshop trap
March (15/3/2022)	0	0	0	0	0	0
April	1.05	0.29	0	7.27	0.28	0
May	11.7	0.12	0	462.88	3.91	0
June	43.16	1.41	0	23.67	0	0.93
July	31.72	3.45	0	50.42	0.52	3.23
August	3.61	0	0	13.25	0	2.16
September (18/9/2022)	0.19	0	0	0.93	0	0.28
Total catch	**61.43**	**5.27**	**0**	**141.52**	**4.71**	**6.60**

Table 14. The catch of juvenile eel at the three ESB operated locations for 2022. The entire catch of 656.43kg were released into the Shannon catchment above Parteen Regulating Weir and Ardnacrusha Generating Station. These catches represent both elver and larger juvenile or 'bootlace' eel (particularly those captured at Parteen Regulating Weir).

A view of the Shannon silver eel release site located at Parteen salmon hatchery located on the lowermost section of the Kilmastulla River. This was redesigned and constructed in 2022.

4.2 The River Lee Eel

The River Lee Silver Eel Trap and Transport Programme

River Lee catchment is a largest part of the South-Western River Basin District (SWRBD), with a catchment area 1,253 km^2 and a mean annual discharge of 27.1 m^3·s^{-1}. Eels are also widespread in the lower parts of the river basin, with 27 % of the catchment area being downstream of Iniscarra HPS, and in parts of Cork Harbour. River Lee discharges 14.5 km below Iniscarra Hydro Station.

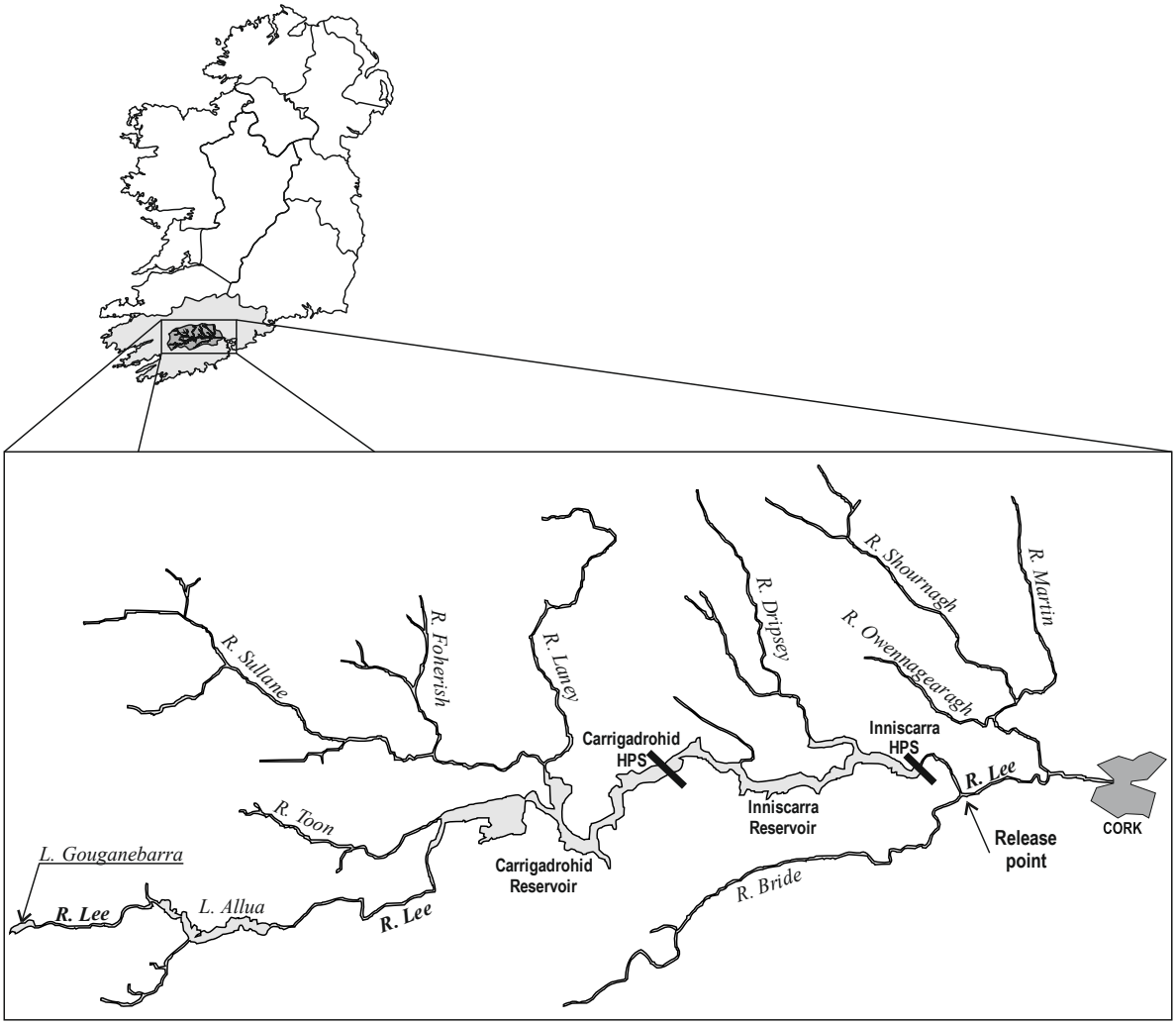


Figure 17. Map of River Lee catchment with release point and hydropower dams indicated.

In the 2022/2023 season, fishing took place on the River Lee at several different locations between 15th September and 27th October 2021 (Figure 17).

The variations in daily catches in relation to lunar cycle is shown in Figure 18.

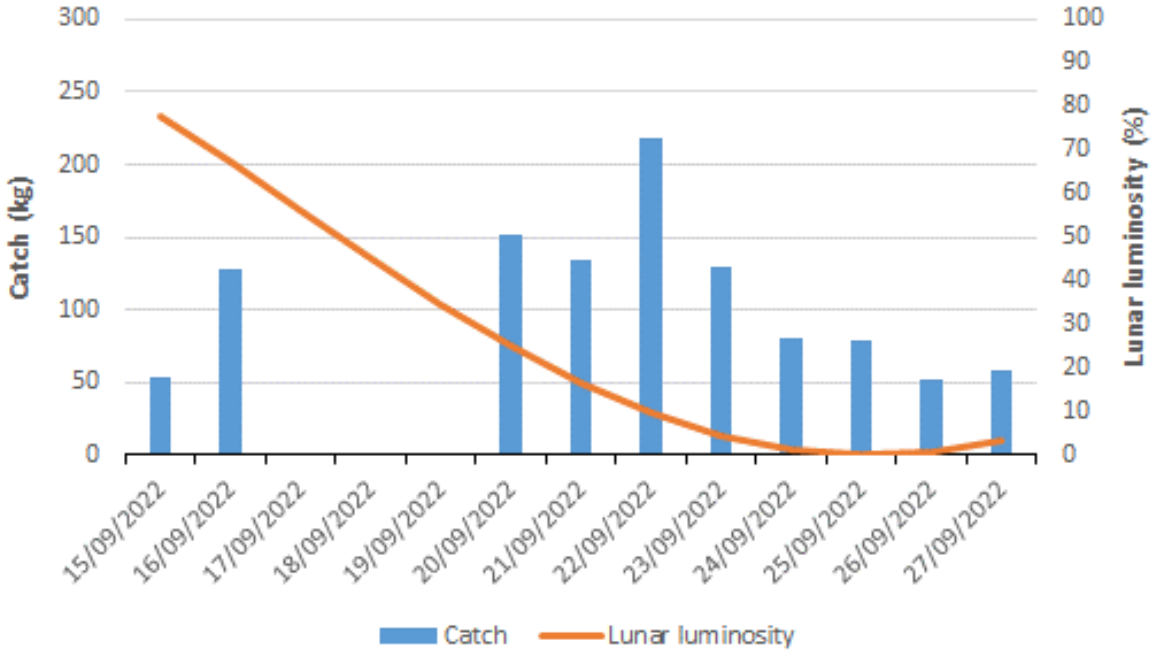


Figure 18. Variations in daily catches in relation to lunar cycle.

The total catch was 1,087 kg, which exceeds the annual target for the river of 500 kg. This is another good catch following a similar level in 2021/22 (1,033 kg). Additional effort in fishing was implemented in these years following a particularly low catch of 35 kg in 2018/19 season (Figure 19).

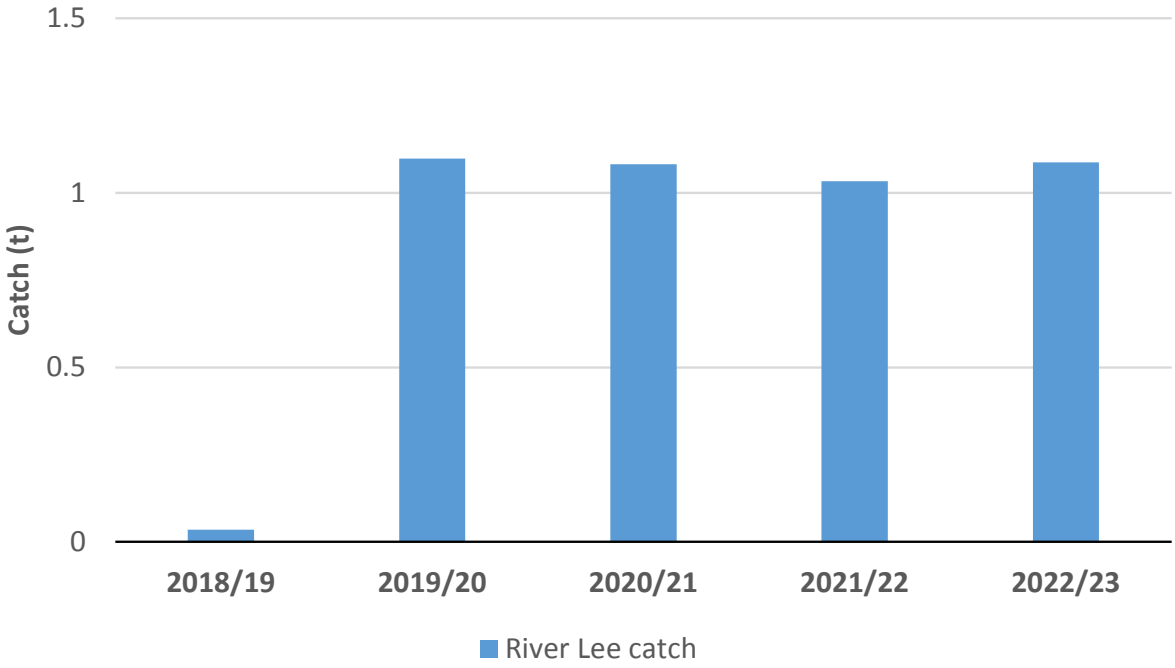


Figure 19. Variations in seasonal River Lee Trap and Transport Program catches in the last five seasons.

The ESB River Lee Trap and Transport catches from 2009-2022 and the achievement of the annual 500kg target is shown in Table 15.

Year	Amount transported (t)	Target	Relation to target
2009	0.079	0.5	16%
2010	0.278	0.5	56%
2011	0.731	0.5	146%
2012	0.234	0.5	47%
2013	0.824	0.5	165%
2014	0.670	0.5	134%
2015	0.515	0.5	103%
2016	0.0435	0.5	8.7%
2017	0.542	0.5	108.4%
2018	0.035	0.5	0.7%
2019	1.098	0.5	219.6%
2020	1.082	0.5	216.4%
2021	1.033	0.5	206.6%
2022	1.087	0.5	
Total	**7.126 tonnes**		

Table 15. The total amounts (t) of silver eel trapped and transported on the River Lee 2009-2022, and the success relative to the target of 500kg set in the National Eel Management Plan.

Lee Eel Stock Enhancement

An elver trap was first put in place in the area immediately below Iniscarra station during 2008. The total catch for 2022 was 1.6kg. These juvenile eels were primarily 'bootlace eel' rather than elvers. The trap operated from the 15th March until the 7th September 2022. Like previous years, the catches were largely recorded for the period early June to the end of August (Table 16). The catches were released into the mid-catchment of the River Bride, which enters the River Lee below Iniscarra station.

	Catch amount
March (began 15th)	0
April	0
May	0
June	640
July	390g
August	30g
September (until 7th)	0
Total	**1.6kgs**

Table 16. The total catch of the Iniscarra elver trap in 2022.

4.3. The River Erne Eel

The River Erne Silver Eel Trap and Transport Programme

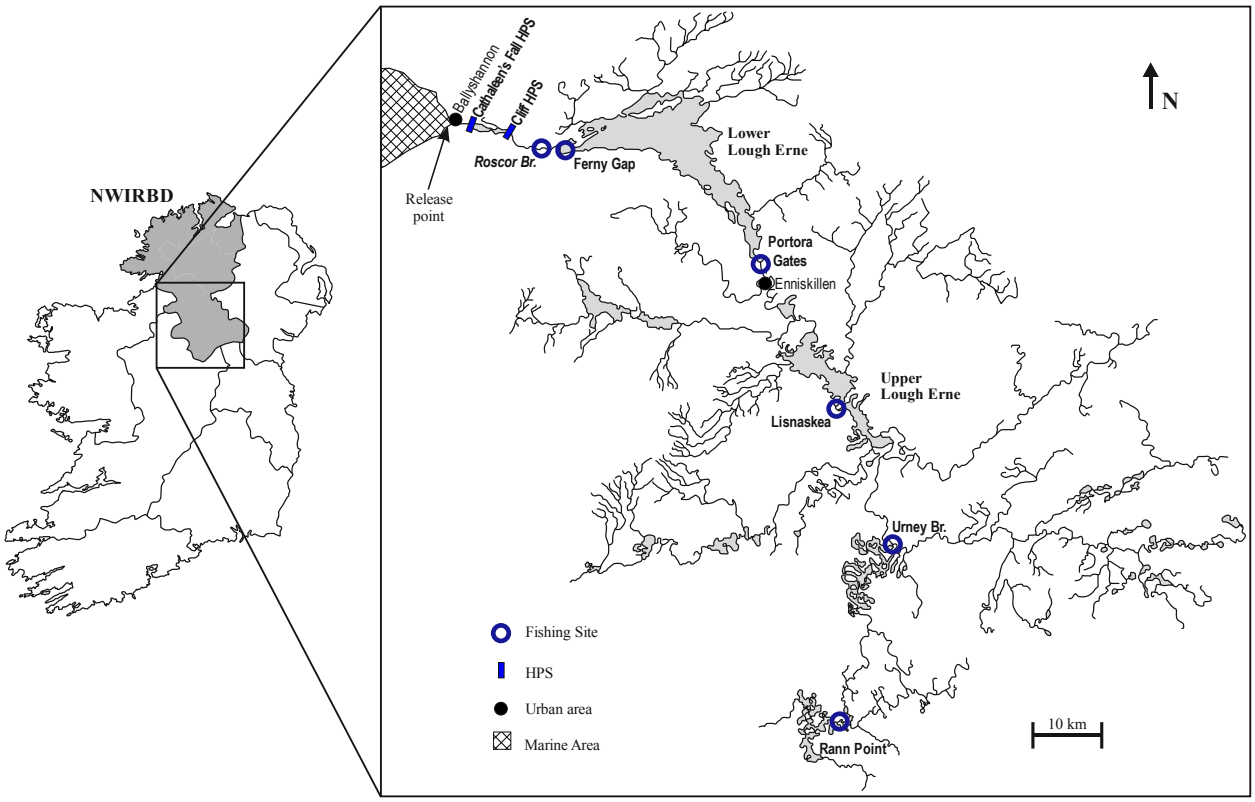


Figure 20. Map of River Erne catchment with conservation fishing sites, release point and hydropower dams indicated.

In 2022, the River Erne system was fished at five sites and the locations of these are indicated on the map (Figure 20). Roscor Bridge, the lowermost site, was not fished during 2022/2023 season. Fishing on other sites started in the last week of August 2022 and finished December 2022, except Ferny Gap, which fished until the first week of March 2023. The total catch contributed to the Trap and Transport programme weighed 40,531 kg. The proportions caught at each site are shown in Figure 21. The total T&T catch in 2022/23 season was comparable with quantities obtained in previous years (Figure 22).

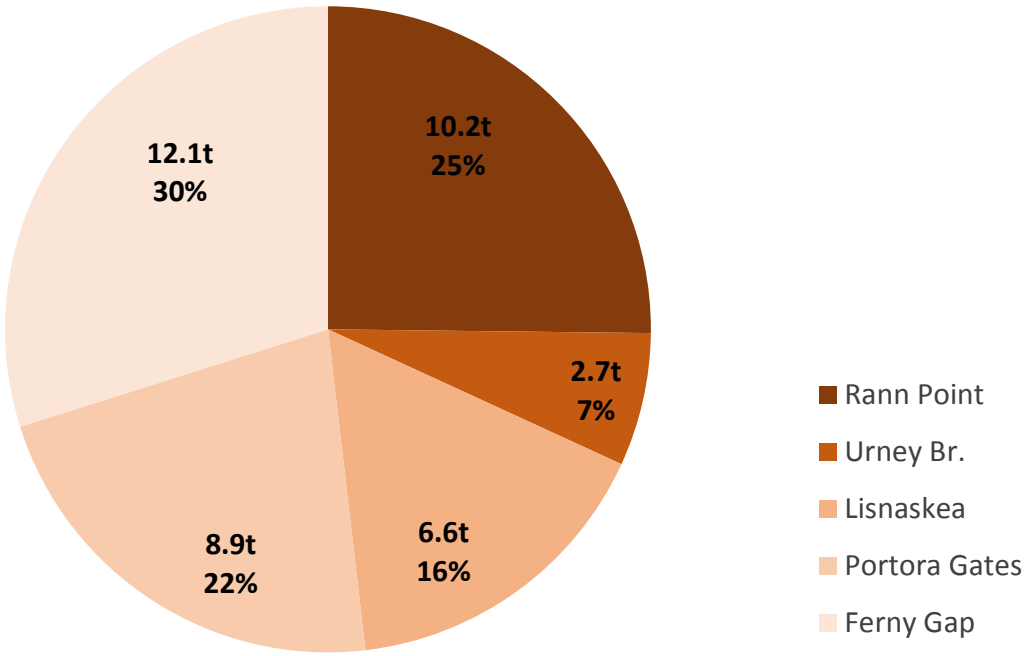


Figure 21. Proportions of the River Erne trap and transport catch obtained by each fishing crew in the 2022/2023 season.

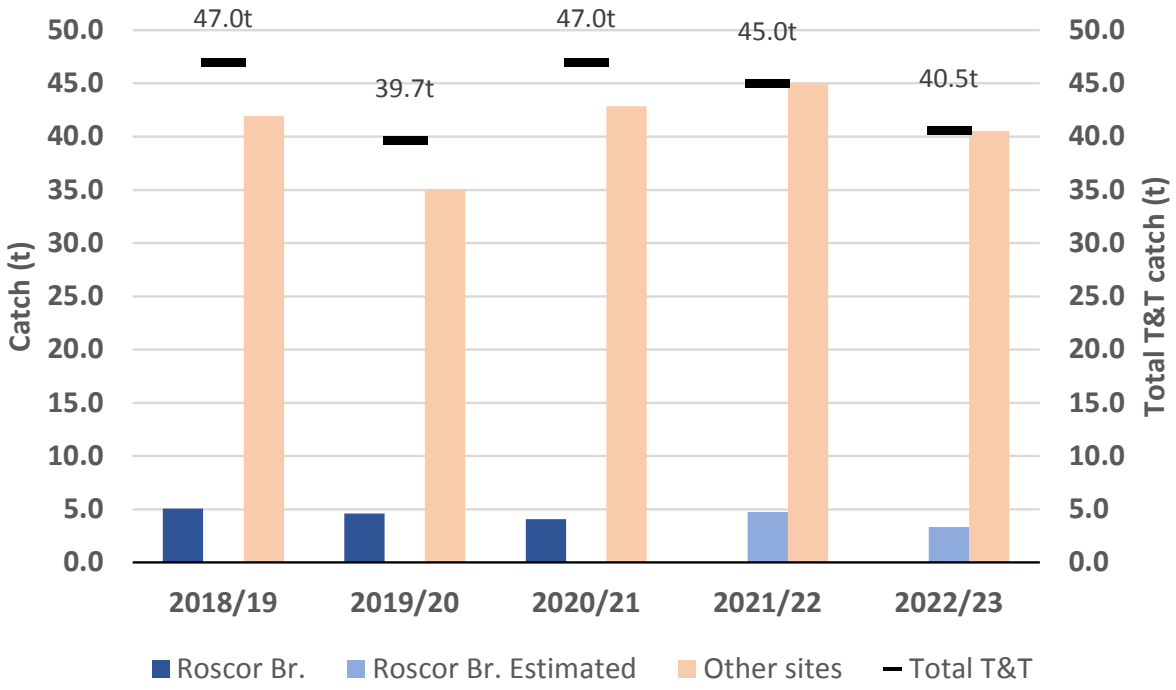


Figure 22. Total Trap and Transport Program, Erne silver eel catches, released in last five seasons, along with proportion of Roscor Bridge catch contributions. Estimated catch in 2021/22 and 2022/23 was only used for production and escapement calculations.

The variation in the daily catches at the Ferny Gap fishing site are shown in Figure 23, with catch levels (and therefore fish migration) affected by discharge level and lunar cycle stage.

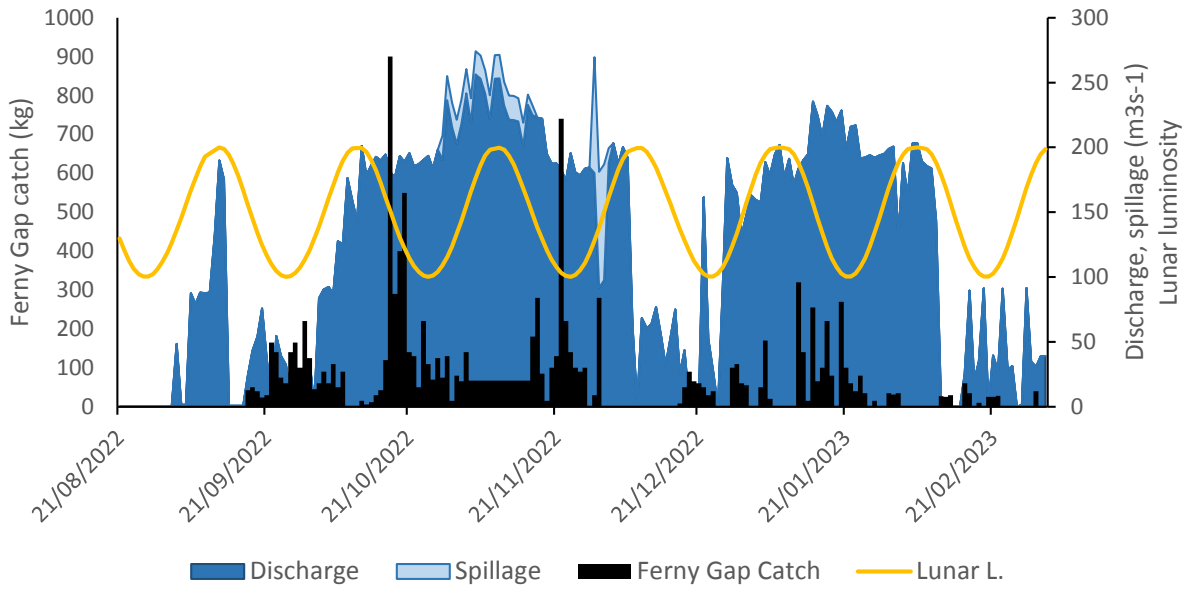


Figure 23. Variation in daily catches at the Ferny Gap fishing site, in relation to lunar cycle and discharge during the 2022/2023 season.

Although not fished during the 2021/22 and 2022/23 season, the Roscor Bridge provides data to allow for the analysis of the silver eel migrations and to the calculation of eel production and escapement for the River Erne (Figure 24 and 25). The site located 750 metres downstream of the outflow point of lower Lough Erne (Figure 20), provides a discrete river section from which it is possible to accurately assess the biomass of uncaptured eels. In previous years this biomass has been estimated based on daily catch records at Roscor Bridge combined with the results of extensive mark–recapture experiments. However, it was noted in previous seasons that Roscor Bridge had limitations as a monitoring site with low discharge and catch levels frequently leading to prolonged periods of fishing crew inactivity. When this occurred, catch records required for the calculation of production were unavailable. This prompted the development of alternative monitoring protocols capable of assisting with the quantification of eel migrations at this site in the absence of T&T catch records.

Based on over a decade of scientific observation, it is possible to predict catch levels on Roscor Bridge fishing site. In 2022/2023 silver eel migration season, it was estimated that the total catch would be 3,331 kg at Roscor Bridge fishing site. 40,531 kg of eels were moved by trap and transport from the five fishing sites upstream of Roscor Bridge. Fishing efficiency rates for calculating production and escapement were based on several mark/recapture experiments carried out by the University of Galway, at the experimental fishing site at Roscor Bridge from 2010/11 to 2015/16 at low discharge (< 130 $m^3 \cdot s^{-1}$= 9.78%) and high discharge (> 130 $m^3 \cdot s^{-1}$= 18.43%). These were used with estimated Roscor Bridge catch (3,331 kg) to calculate the biomass of eels arriving there (21,410 kg), based on the flow conditions throughout the season.

The silver eel production was estimated to be 61,941 kg (Figure 24), and escapement was estimated to be 52,615 kg (84.9% of production). The trap and transport catch of 40,531 kg at the five fishing sites represented 65.4% of the production (exceeding the 50% target by 9,561 kg).

A total of 21,410 kg of eels are estimated to have passed the weir and moved through the hydropower stations at Cliff and Cathaleen's Fall. Mortality at each station is based on historic telemetry work conducted by

the University of Galway at the two stations, depending on the operations of the dams throughout the season. Total mortality was estimated to be 5,413 kg at Cliff and 3,913 kg at Cathaleen's Fall.

In total, 12,084 kg of eels are estimated to have navigated beyond the hydropower stations, and with the trap and transport quantity of 40,531 kg, a total escapement of 52,615 kg is estimated. The average value of escapement as a percentage of production was 83.3% in last five years, where in 2022/23 season it is 84.9% (Figure 24).

The estimates of production and escapement, together with trap and transport quantities for last five subsequent years are similar, and do not present any significant trends (Figure 25).

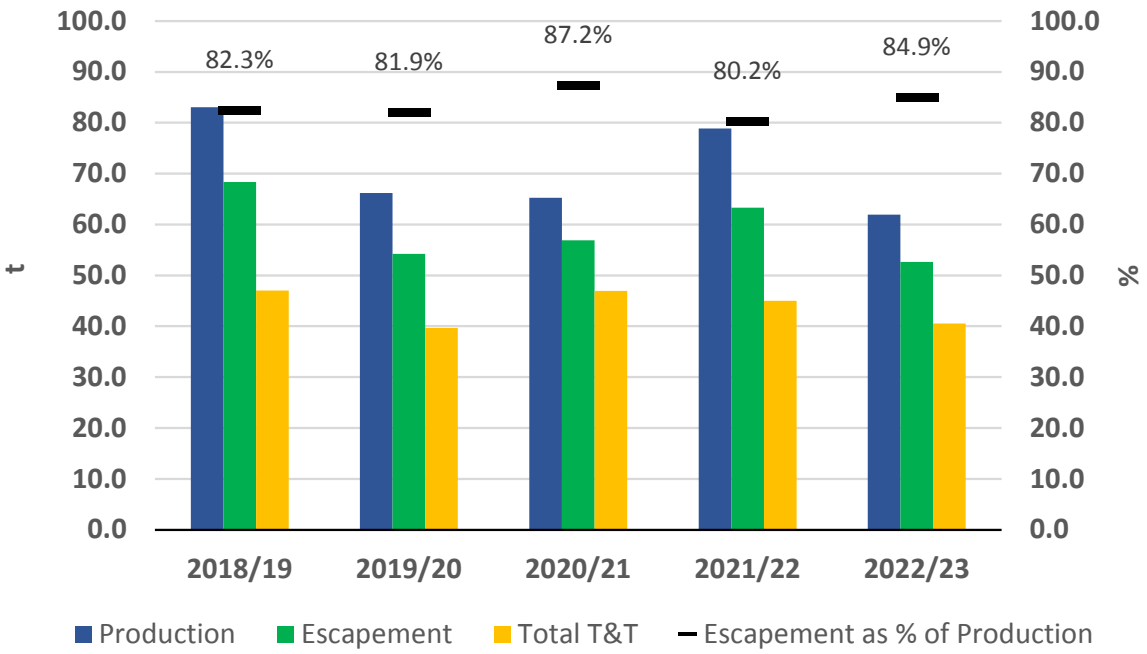


Figure 24. Estimates of production and escapement, together with trap and transport quantities and escapement as a percentage of production values, in last five seasons.

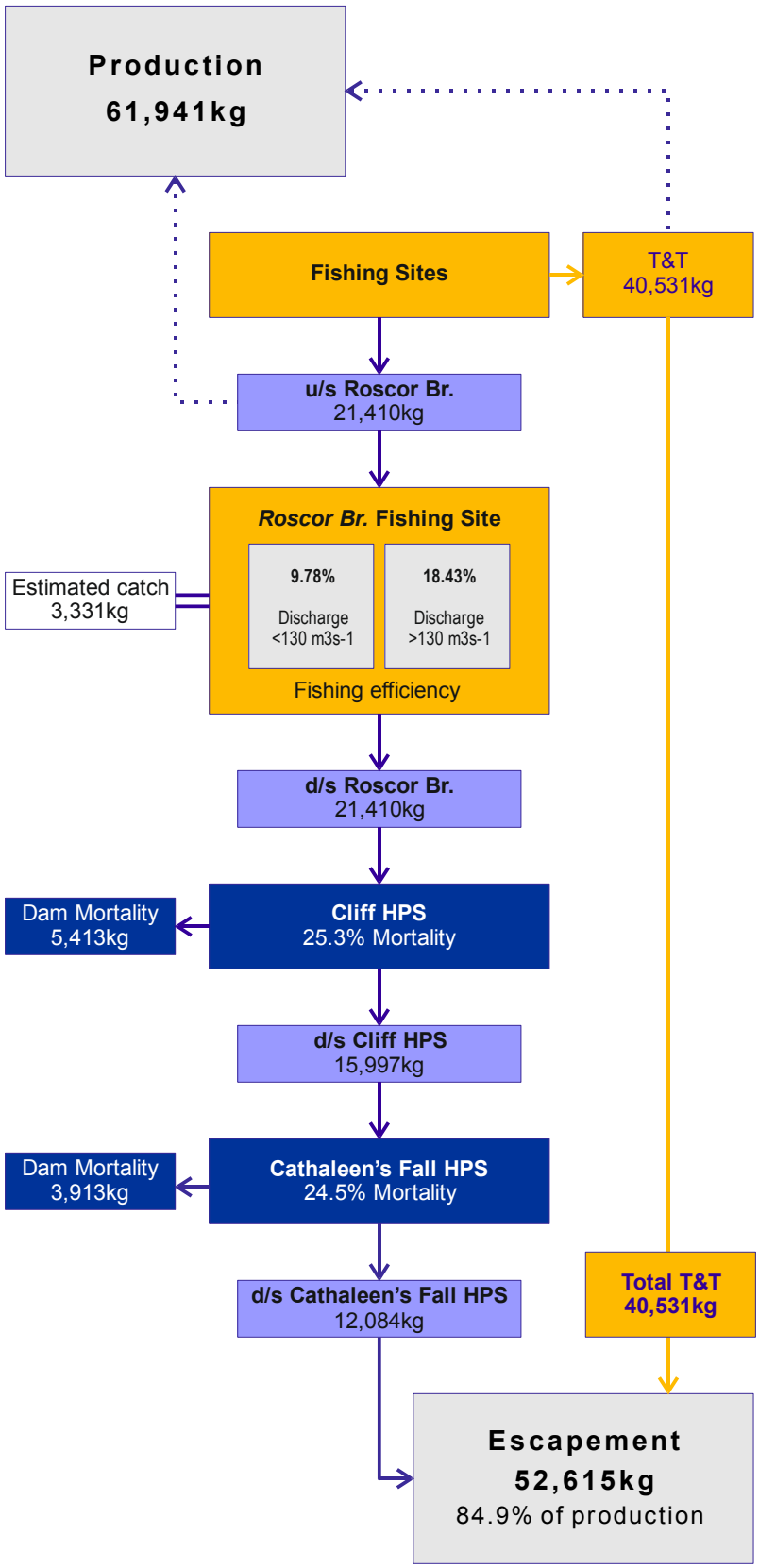


Figure 25. A summary of the analysis of silver eel production and escapement in the River Erne during the 2022/2023 eel migration season.

Erne Eel Stock Enhancement

A total catch of 641.15kg was reported for the three Cathaleen's Fall elver traps during 2022. Details of the release locations into the Erne catchment above the hydro-stations are given below in Table 17 and the catch per month is shown in Table 18. All three traps were closed on the 9th of September. The catch of elver for the period 1960 to 2022 is shown in Figure 26. The 'R. Erne Elver Monitoring/Trapping Protocol' (agreed between ESB, Inland Fisheries Ireland and Department of Agriculture, Environment and Rural Affairs, Northern Ireland), involves more frequent surveillance and emptying of these elver traps. During the period 2014 - 2018, significant upgrades were also carried out on the trap infrastructure which included the provision of greater water supplies and improved aeration systems. New elver ramp climbing substrates were also fitted to each of the three climbing ramps. A new entrance onto the ramp at the Southbank trap was added in 2017 to allow direct access from the fish pass entrance. An additional new trap (Northern Bank) was added to the two pre-existing Cathaleen's Fall traps in 2015.

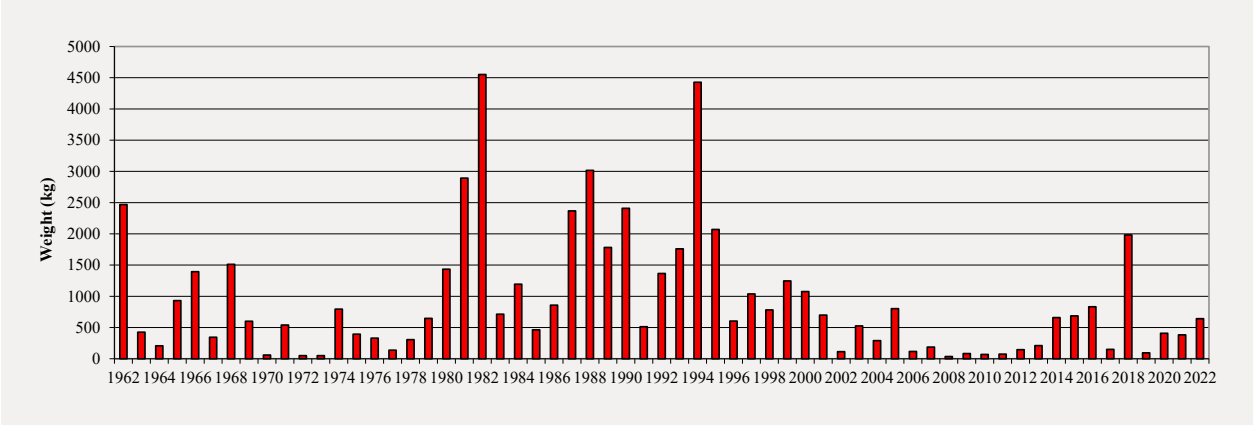


Figure 26. The catch of juvenile eel from Cathaleen's Fall generating station for 1960-2022.

Table 17. The catch (Kg) and release locations of juvenile eel captured at Cathaleen's Fall generating station in 2022.

Date	D/S Box (South Bank)	G5 Box	H.L Box (Northern Bank)	Stocked Area
25th March	0.0	12.5	0.5	Lusty Beg
26th March	0.0	1.0	0.2	Garvary
28th March	0.0	40.8	3.8	Muckross
28th March	0.0	1.3	0.0	Muckross
29th March	0.0	4.6	0.0	Rosclare
1st April	0.0	10.0	1.0	Carrybridge
2nd April	0.0	13.4	1.9	Bellanlaeck
3rd April	0.0	10.7	2.8	Camagh Bay
4th April	0.0	5.4	6.3	Trory
5th April	0.0	7.6	3.8	Derryadd
6th April	0.0	14.0	5.5	Rosclare
7th April	0.0	47.2	5.7	Rosdoney
7th April	0.0	1.4	0.0	Garvary
8th April	0.0	4.5	0.4	Share centre
8th April	0.0	0.5	0.1	Lusty Beg
11th April	0.0	1.3	0.0	Rosclare
15th April	0.0	2.8	1.3	Trory
17th April	0.0	10.8	3.8	Muckross
18th April	0.0	4.7	1.5	Pump house
20th April	0.0	5.7	0.5	Pump house
22nd April	0.0	4.3	0.7	Trory
24th April	0.0	4.5	0.7	Camagh Bay
26th April	0.0	13.1	2.6	Lusty Beg
28th April	0.0	17.7	10.4	Carrybridge
29th April	0.0	60.8	15.3	Muckross
29th April	0.0	18.2	6.4	Pump house
30th April	0.0	25.0	13.9	Upper MacNean
30th April	0.0	7.8	6.6	pump house
1st May	0.0	4.7	4.9	Upper MacNean
2nd May	0.0	1.8	0.4	Ely Lodge
3rd May	0.0	2.6	6.6	Lusty Beg
4th May	0.0	2.1	3.5	Muckross
5th May	0.0	1.4	1.5	Lusty Beg
6th May	0.0	4.0	2.6	Rossigh
7th May	0.0	1.6	0.9	Camagh Bay
16th May	0.0	2.4	1.6	Carrybridge
18th May	0.0	1.3	1.3	pump house
20th May	0.0	1.0	1.0	Lusty Beg
23rd May	0.0	0.7	0.4	Camagh Bay
27th May	0.0	1.6	2.4	Lusty Beg
31st May	0.0	1.8	3.4	Muckross
3rd June	0.0	3.5	1.0	Lusty Beg
6th June	1.0	1.6	1.0	Lusty Beg
10th June	2.7	1.3	0.6	Muckross
14th June	3.0	1.4	0.8	Garvary
17th June	1.6	0.6	0.4	Muckross

Date	1.1	G5 Box	Northern Bank Trap	Stocked Area
21st June	1.1	1.1	0.4	Garvary
24th June	0.9	2.4	0.4	Lusty Beg
27th June	0.4	0.5	0.3	Rosclare
1st July	0.4	0.5	0.0	Pump house
5th July	0.3	0.4	0.1	Lusty Beg
8th July	0.0	0.3	0.1	Garvary
11th July	0.2	0.2	0.1	Muckross
15th July	1.0	1.0	0.2	Garvary
20th July	2.4	14.2	0.3	Muckross
22nd July	1.6	7.6	0.1	Lusty Beg
24th July	1.6	22.0	0.0	McNean
24th July	2.7	17.5	0.0	Camagh Bay
27th July	2.6	3.0	0.0	Muckross
2nd August	1.4	0.4	0.0	Garvary
5th August	0.4	0.6	0.0	Lusty Beg
9th August	0.2	1.1	0.0	Rosclare
12th August	1.0	2.4	0.0	Rossigh
16th August	4.4	5.2	0.0	Camagh Bay
19th August	0.8	3.5	0.0	Ely Lodge
22nd August	0.1	0.5	0.0	Rossigh
26th August	0.1	0.2	0.0	Bellanlaeck
30th August	0.4	0.2	0.0	Garvary
2nd September	0.4	1.4	0.0	Lusty Beg
5th September	0.0	0.7	0.0	Muckross
9th September	0.0	2.6	0.0	Muckross

Table 18. The catch and release locations of elver captured at Cathaleen's Fall generating station for each month of trapping in 2022.

	Fish pass trap	G5 trap	Northern bank trap	Total catch (Kg)
March	0	60.2	4.5	**64.7**
April	0	291.4	91.3	**382.7**
May	0	27.0	30.5	**57.5**
June	10.7	12.4	4.9	**28.0**
July	12.9	66.7	0.9	**80.4**
August	8.7	14.1	0	**22.8**
September (9th)	0.4	4.7	0	**5.1**
Total	**32.7**	**476.5**	**132.1**	**641.15kg**

Chapter 5. ESB Fisheries Strategy

ESB's Corporate Strategy 'Net Zero by 2040' calls for ESB to step forward on our social and environmental responsibilities. ESB Fisheries can play an important role in this strategy and in response, ESB Fisheries is currently updating its strategy. This has begun in 2022 and will be completed in 2023.

Currently, the strategy foresees three strategic goals of:

1. Conservation
2. Biodiversity and
3. Communities

Once finalised, the strategy will include a detailed list of actions on each of ESB fisheries catchments under these strategic goals. Further details will be available on the final strategy on ESB's Website when it is published and further details will also be included in the 2023 Annual Report.

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