National Programme: Habitats Directive and Red Data Book Fish Species

Summary Report

2024

IFI/2026/1-4800





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Habitats Directive Report 2024

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Executive Summary

Inland Fisheries Ireland (IFI), on behalf of the Department of Climate, Energy and the Environment (DCEE), is responsible for monitoring and reporting on the Habitats Directive Annex II/V fish species (lamprey, shad, pollan and salmon). In the most recent Article 17 Report (NPWS, 2019), brook lamprey (*Lampetra planeri*) and Killarney shad (*Alosa fallax killarnensis*) were assessed as having a favourable conservation status. The status of river lamprey (*Lampetra fluviatilis*) is unknown and there is a focus on assessing the distribution of this species in the current reporting cycle. Sea lamprey (*Petromyzon marinus*), twaite shad (*Alosa fallax*) and pollan (*Coregonus autumnalis*) have a bad conservation status and conservation measures will have an important role in attempting to improve the prospects for these species into the future.

The monitoring programmes for lamprey and shad continued in 2024, which represented the sixth and final year in the 6-year Article 17 reporting cycle (2019 – 2024). The field work schedule runs from March to October and a variety of survey techniques are used to collect data on the various life stages of these conservation fish species. Similarly to the situation in 2023, weather conditions continued to be challenging in 2024. High rainfall in March, April and, to a certain extent in May, resulted in higher river flows and this impacted shad egg surveys and river lamprey redd count surveys.

Larval lamprey electro-fishing surveys were conducted between the 20th August and 25th September in 2024. A total of 33 index sites within 6 catchments/channels and 3 River Basin Districts (Shannon, Western & North-Western) were sampled. These included the Moy, Feale and Mulkear SAC channels and the Swilly, Leannan and Clodiagh (Brosna – Lower Shannon) non-SAC channels. A total of n=679 *Lampetra* sp. (river/brook lamprey) was recorded in 2024 as well as 2 sea lamprey larvae and 3 river lamprey transformers. The river lamprey transformers were captured upstream of barriers on the Feale and Leannan and these are the first records for this species in these rivers since larval lamprey surveying commenced in 2007.

River lamprey redd counts were carried out from 23rd April to 18th June on seven SAC and non-SAC catchments (Avoca, Boyne, Dee, Maigue, Mulkear, Slaney and Suir). Sites where redds were previously observed were visited on several occasions. Evidence of spawning was identified in two catchments – Dee and Slaney. Spawning records for 2024 were absent across the remainder of the catchments. A protracted spell of unsettled weather during this period resulting in elevated river levels may have affected spawning success across numerous catchments during 2024.

Sea lamprey spawning hotspot surveys were undertaken in May and June across the network of established locations, many situated below major barriers to fish passage. An unexpected fall-off in the numbers of redds encountered was noted in several locations around the Lower Shannon SAC, most worryingly at Annacotty on the Mulkear River.

Shad egg kick sampling was undertaken on the River Barrow at St. Mullins in 2024. Egg surveys are an effective technique for investigating the location, timing and duration of twaite shad spawning events. Weekly sampling occurred over a 15-week period from 19th April to 24th July. Eggs were first recorded in the fourth week of April (with a water temperature of 11.8°C) and continued for a 12-week period up to the second week of July. The total number of eggs was n=874, with the highest count (n=314) occurring in the third week of May.

Shad egg surveys were also carried out on the River Suir, at the site upstream of Carrick-on-Suir, over a 9-week period in 2024 from 25th April – 3rd July. Eggs were recorded consecutively for 5 weeks (total n = 53), peaking with a count 31 eggs on 30th May when the water temperature was 14.1°C.

As part of IFI's National Bass Conservation programme, a seine netting survey for juvenile bass (*Dicentrarchus labrax*) was carried out at a site on the Slaney estuary on August 20th. The presence of young-of-year and juvenile shad and smelt (*Osmerus eperlanus*) as bycatch in these surveys, can give an indication of spawning events for these species in the system. However, as in previous years, no shad or smelt were recorded on the Slaney in 2024.

The fish communities in 3 estuaries (Munster Blackwater, Barrow-Suir and Slaney) were surveyed *via* trawled transects from the 21st August – 3rd September. These surveys are conducted annually primarily to provide data for IFI's National Bass Programme. Species of interest to the Habitats Directive Monitoring Programme are also occasionally encountered. Twenty-three shad (measuring 110 – 390 mm) were captured from the 3 estuaries and no smelt were recorded in the 2024 trawling surveys.

IFI carries out surveillance monitoring of fish in transitional waters under the Water Framework Directive (WFD). The monitoring programme is carried out on the Barrow-Nore-Suir complex on a 3-year rolling programme and was sampled in September and October 2024. Three netting techniques were used in this survey, stretching from the mouth of the estuary to the upper estuarine stretches, and 12 juvenile shad were captured from the beach seines and fyke nets. They were recorded in 7 out of 42 seine nets, 1 out of 32 fyke nets and 0 out of 44 beam trawls and ranged in length from 66 - 185 mm. Fourteen smelt were recorded from 4 beach seine net hauls and 2 beam trawl samples and these fish measured 65 – 200 mm in length.

1. Introduction

Biodiversity loss and ecosystem collapse, accompanied by climate change and environmental degradation, have been identified as the biggest threats facing the planet in the next decade and into the future (WEF, 2020). Significant alterations have already occurred, with numerous indicators of ecosystem health and biodiversity vigour showing rapid decline (IPBES, 2019). These negative trends in biodiversity and ecosystem functions are projected to continue and worsen. By way of example, monitored populations of migratory freshwater fish globally have declined by an average of 76% between 1970 and 2016 (Deinet, S. *et al.*, 2020; WWF, 2022), with average declines especially pronounced in Europe (-93%) in comparison with other continents. These data, unfortunately, point to an alarming regional trend across the EU with 60% of rivers, lakes, wetlands, and streams currently deemed not healthy, thereby impacting on the quality and availability of water and the species populations they house, including freshwater fish species (migratory and non-migratory), as well as birds, mammals, and amphibians. At least 37% of Europe's native species of freshwater fishes and lampreys were classified as threatened (Freyhof & Brooks, 2011), a figure which will doubtless be revised upwards.



Plate 1.1. The Swilly River, New Mills, Co. Donegal.

Major threats include increased abstraction of water - further exacerbated by increasing droughts and temperature scenarios due to climate change, pollution, invasive species, overfishing, presence of historical and obsolete man-made barriers along with current dam construction resulting in loss of connectivity, increased fragmentation, and alteration of aquatic habitats (Almeida *et al.*, 2023). Europe has the most obstructed and fragmented river landscape on the planet, with at least 1 million barriers in operation (Belletti *et al.*, 2020). There is a requirement for far-reaching and effective legislation which protects habitats and species into the future, as well as restoring biodiversity and rehabilitating ecosystem functions.



Plate 1.2. River Clodiagh (Brosna), Gorteen Bridge, Co. Offaly

The EU Habitats Directive (Council Directive 92/43/EEC), along with the Bird's Directive and Water Framework Directive (WFD), are the principal legislative tools for the protection of nature in Europe. Habitats and species that are listed in the Directive's annexes are required to achieve favourable conservation status and a network of protected sites, called Special Areas of Conservation (SACs), have been established across Europe for their protection. Under Article 11 of the Directive, member states are required to carry out surveillance monitoring of the species and Article 17 requires reporting on the conservation status of species on a 6-year rolling cycle. Inland Fisheries Ireland (IFI), on behalf of the Department of the Environment, Climate and Communications (DECC), is the state agency responsible for reporting on the fish species across this jurisdiction (Table 1.1).



Plate 1.3. Lough Salt, Co. Donegal.

In addition to fulfilling the reporting requirements of the Directive, the IFI Habitats Directive surveying team also monitors 2 fish species of conservation interest listed in the Irish Red Data Book (King *et al.*, 2011), namely, Arctic char (*Salvelinus alpinus*) and smelt (*Osmerus eperlanus*).

Table 1.1. Habitats Directive Fish Species and Conservation Status.

Species	Habitats Directive Annex	Habitats Directive Conservation Status (2019)	Red Data Book
Sea Lamprey (*Petromyzon marinus*)	Annex II	Bad	Near Threatened
River Lamprey (*Lampetra fluviatilis*)	Annex II, V	Unknown	Least Concern
Brook Lamprey (*Lampetra planeri*)	Annex II	Favourable	Least Concern
Twaite Shad (*Alosa fallax fallax*)	Annex II, V	Bad	Vulnerable
Killarney Shad (*Alosa fallax killarnensis*)	Annex II, V	Favourable	Vulnerable
Pollan (*Coregonus autumnalis*)	Annex V	Bad	Vulnerable

It is critically important that changes to biodiversity and the status of species are accurately identified and quantified through effective monitoring programmes (Lindenmayer *et al.*, 2012; Pocock *et al.*, 2015). To this end, the scope and scale of surveying and monitoring efforts are important considerations to avoid biased, incomplete and inaccurate appraisal (Anderson, 2018; Valdez e*t al.*, 2023). Large-scale, long-term monitoring programmes can yield invaluable datasets lending themselves to establishment of baselines, detection of trends and forecasting of prospects.



Plate 1.4. River Nore, Thomastown, Co. Kilkenny.

However, it is imperative that they are well-designed, correctly implemented and sustained over time (Lindenmayer & Likens, 2018; Lindenmayer *et al.*, 2022).To this end, the IFI Habitats Directive team has endeavoured to undertake a comprehensive and relevant monitoring programme, focussing upon species distributions, abundances, and phenology, thereby satisfying the requirements for Article 17 reporting on listed fish species. During this current 6-year reporting period, the team has built upon and further developed a nationwide network of larval lamprey index sites. Systematic efforts directed towards cryptic and data-deficient species, such as river lamprey, sea lamprey and twaite shad, has dramatically increased our knowledge of their distribution and spawning behaviour. The Habitats Directive team liaises closely with colleagues to gather data from lake surveys regarding the status of Killarney shad and pollan, whilst also undertaking routine repeat surveys of lakes where populations of Arctic char are known to persist. Staff members are also on hand to assist with netting and trawling surveys in transitional habitats of SACs where various life-stages of several species of interest are encountered. The current year, 2024, represents the final year in the present 6-year monitoring and reporting cycle (2019–2024) for Article 17. When required, assistance and advice in the field was provided by regionally based IFI colleagues.



Plate 1.5. Annalee River, Co. Cavan.

2. Lamprey Monitoring Programme

2.1 Larval Lamprey Sampling

The larval stage of the life cycle of a lamprey lasts from 4 – 6 years and during this time they live in fine sediments filter feeding on organic matter. They then undergo metamorphosis which occurs over a few months, usually between July and September. During metamorphosis lamprey are referred to as transformers while the post-metamorphosis stage is called a juvenile or macrophthalmia. As part of the current 6-year monitoring cycle (2019 – 2024), a number of index sites are being sampled for larval lamprey. These sites were selected from previous catchment-wide surveys carried out over the period 2009 – 2018. They are used to assess the brook lamprey (*Lampetra planari*) range and population size as well as the extent and quality of habitat for all 3 lamprey species. The anadromous river lamprey (*Lampetra fluviatilis*) is indistinguishable from brook lamprey at the larval stage and, while larval *L. fluviatilis* may be captured during the surveys, it is assumed the majority of larvae are *L. planeri*, particularly when occurring above natural or artificial barriers to migration. Once metamorphosis has occurred, it is possible to distinguish between the two species and, while rarely encountered, river and brook macrophthalmia are noted during surveys. Sea lamprey (*Petromyzon marinus*), also an anadromous species, is distinguishable from *Lampetra* spp. at the larval stage but they are rarely encountered in surveys. This may be due to several reasons, including a smaller distribution and population size. Further research is also required to understand their habitat utilisation at this early life stage.

A selection of index sites was targeted for sampling during the period August - September in 2024. Surveying during this timeframe provides the best opportunity to capture the full range of size classes from young-of-the-year larvae to macrophthalmia. Index sites have been allocated for 13 SAC and 10 non-SAC catchments within 7 River Basin Districts (RBDs) and will provide data for the assessment of short-term and long-term trends in the population size of *L. planeri*. Sites within SAC rivers are sampled three times, while non-SAC sites are sampled twice within the 6-year reporting cycle.

Electro-fishing surveys were carried out between the 20th August and 25th September. A total of 33 index sites within 6 catchments/channels and 3 RBDs (Shannon, Western & North-Western) were sampled (Table 2.1). These included the Moy, Feale and Mulkear SAC channels and the Swilly, Leannan and Clodiagh (Brosna – Lower Shannon) non-SAC channels. All of these index sites have been sampled twice in this 6-year monitoring cycle.

Table 2.1. Density and population structure of larval lamprey from index sites on seven channels/catchments in 2024.

River Basin District (RBD)	Catchment (* SAC)	No. Sites	Min. Density (fish/m^2)	Max. Density (fish/m^2)	Mean Density (fish/m^2)	Min. Length (mm)	Max. Length (mm)
North-Western	Leannan	5	0	75	33	27	132
North-Western	Swilly	2	20	30	25	14	122
Shannon	Brosna	4	12	36	23	14	141
Shannon	Feale*	6	9	63	24	26	143
Shannon	Mulkear*	6	9	80	31	15	128
Western	Moy*	10	0	13	5	20	133

A semi-quantitative sample was taken at each site by electro-fishing in a defined area (1 m^2) of suitable nursery habitat, generally comprising fine sediments. A single anode backpack is used to electro-fish for lamprey using a pulsed DC and a low frequency (10 Hz) setting. The anode is placed approximately 10–15 cm above the sediment, energized for 20 seconds, switched off for 5 seconds and this cycle is repeated for a period of 2 minutes. Immobilised larvae are collected using a fine mesh net and transferred to a bucket of water. Once 5 mins have elapsed, a second fishing and, occasionally a third fishing, is carried out until an approximate 50% depletion is achieved. All lamprey are enumerated and measured to the nearest millimetre. As young-of-the-year larvae can be difficult to capture using this method, a quantitative pushnet sample is also taken from adjacent suitable areas of deposition, if available. The spoil from these pushnet samples is emptied onto a tarpaulin sheet and any larvae present are collected for processing.

Water temperature and conductivity were measured at each site and habitat characteristics were noted, including sediment type, water depth, flow type, shading, channel modification etc. Water temperatures during the survey period ranged from 12°C at a site on the Mulkear River (MUL02) on 4th September to 16.7°C at a site on the Moy (MOY71) on 3rd September.



Plate 2.1. A larval lamprey index site (CLO02) on the Clodiagh (Brosna – Lower Shannon) in 2024.

A total of n=679 larval *Lampetra* spp. was recorded in addition to two sea lamprey larvae and three river lamprey transformers (Figures 2.1 to 2.5). On the River Feale, sea lamprey larvae were recorded at FEA99 (77 mm total length) and FEA16 (121 mm) and river lamprey transformers were captured at FEA16 (106 mm) and FEA98 (115 mm). FEA99 is in the upper tidal section of the river (Figure 2.2), while FEA16 and



Plate 2.2. A river lamprey transformer and a sea lamprey larva from the Mulkear (Annacotty) and the Feale (Finuge Bridge), respectively.

FEA98 are upstream of two substantial barriers: the weir at Scartleigh and the Racecourse Bridge in Listowel. A river lamprey transformer was also captured at LEN04 on the Leannan river (Figure 2.5). This site is approximately 14 km upstream of a barrier located in the upper tidal limits (immediately upstream of Ramelton). These are the first records for river lamprey in the Feale and Leannan since larval lamprey surveys commenced in 2007. There were no larvae recorded at 2 sites on the Leannan (LEN14 and LEN15) and one site on the Moy (MOY63). Densities ranged from 2/m^2 at sites on the Moy (MOY34, MOY60 and MOY34) to 80/m^2 at a site on the Mulkear (MUL14). High densities (63/m^2 – 75/m^2) were also recorded at several sites on the Feale and Leannan. Mean

densities ranged from 5/m^2 on the Moy to 33/m^2 on the Leannan (Table 2.1).



Plate 2.3. Scartleigh Weir and the Listowel Racecourse Footbridge - barriers to lamprey spawning migration on the River Feale.

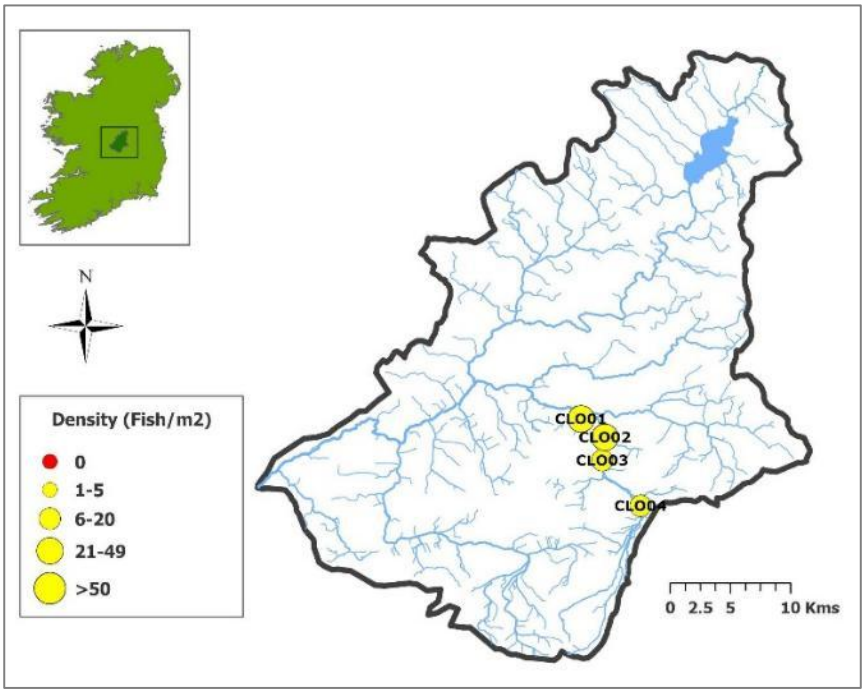


Figure 2.1. Larval *Lampetra* spp. densities at index sites on the Brosna-Clodiagh (Shannon) catchment in 2024.

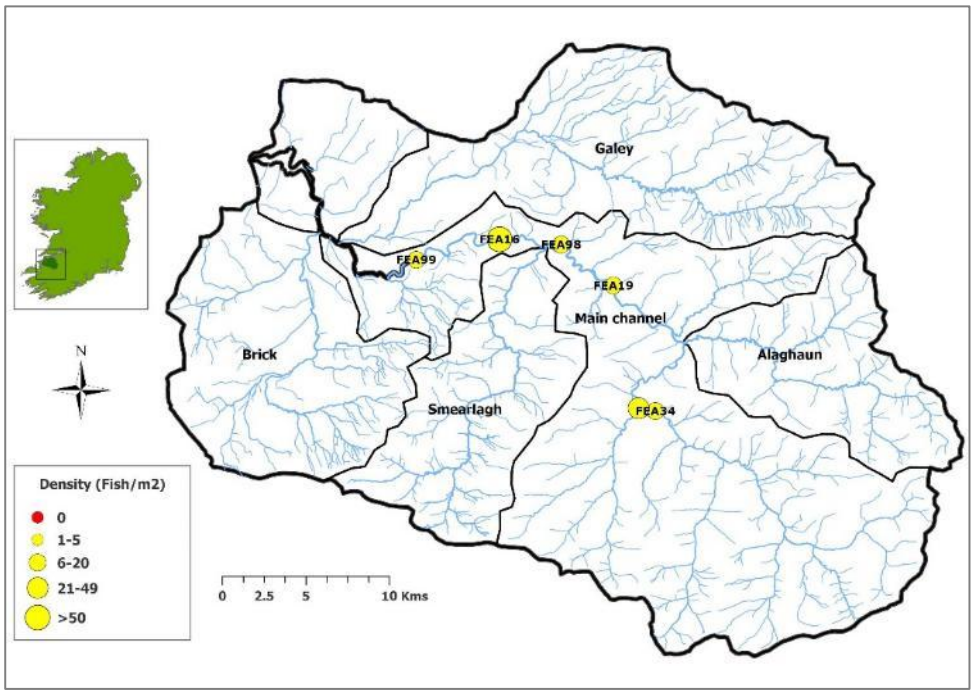


Figure 2.2. Larval *Lampetra* spp. densities at index sites on the Feale catchment in 2024.

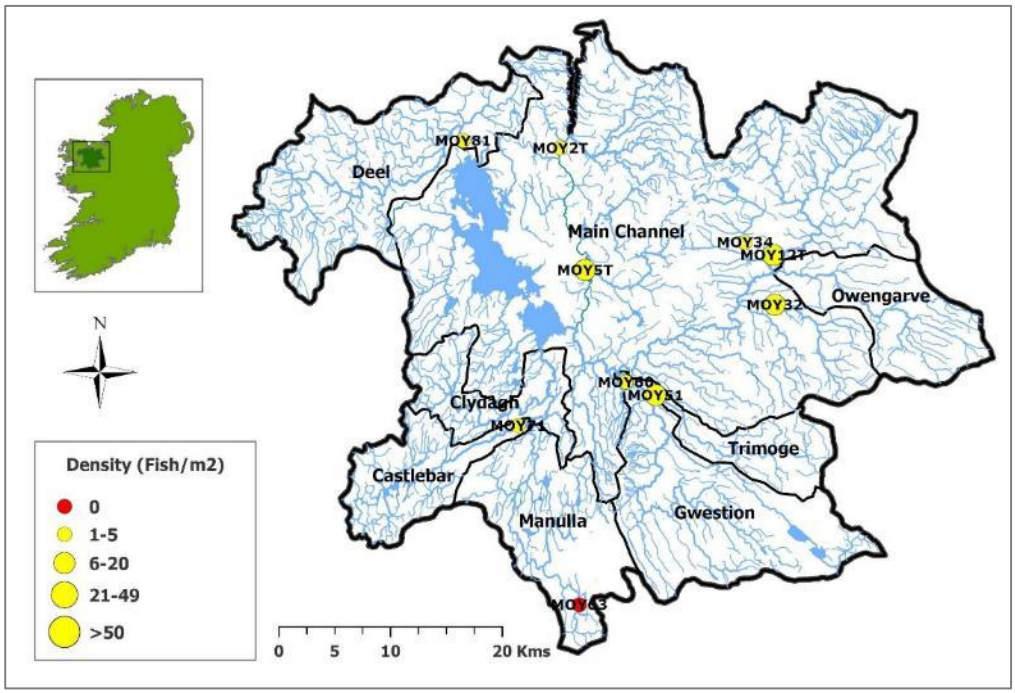


Figure 2.3. Larval *Lampetra* spp. densities at index sites on the Moy catchment in 2024.

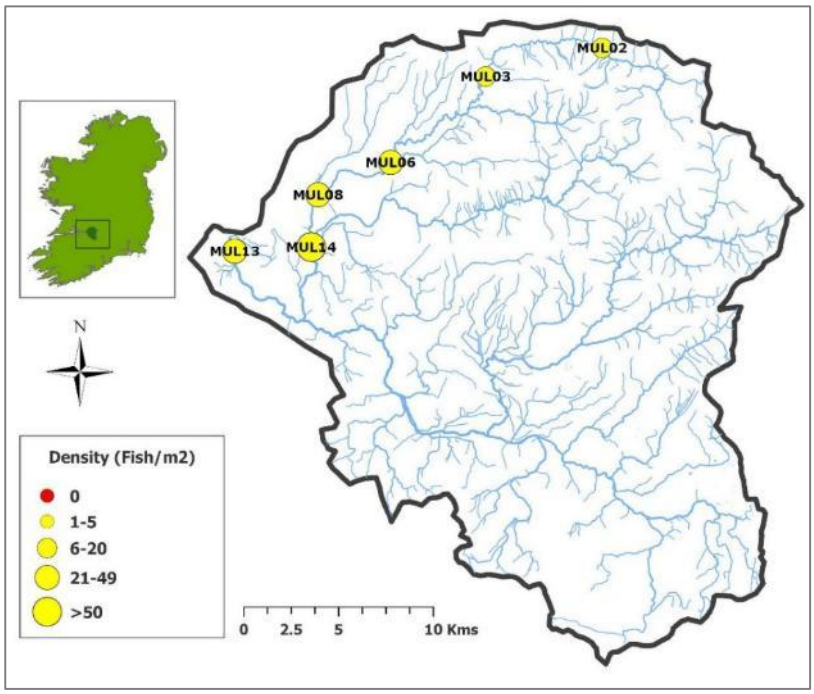


Figure 2.4. Larval *Lampetra* spp. densities at index sites on the Mulkear catchment in 2024.

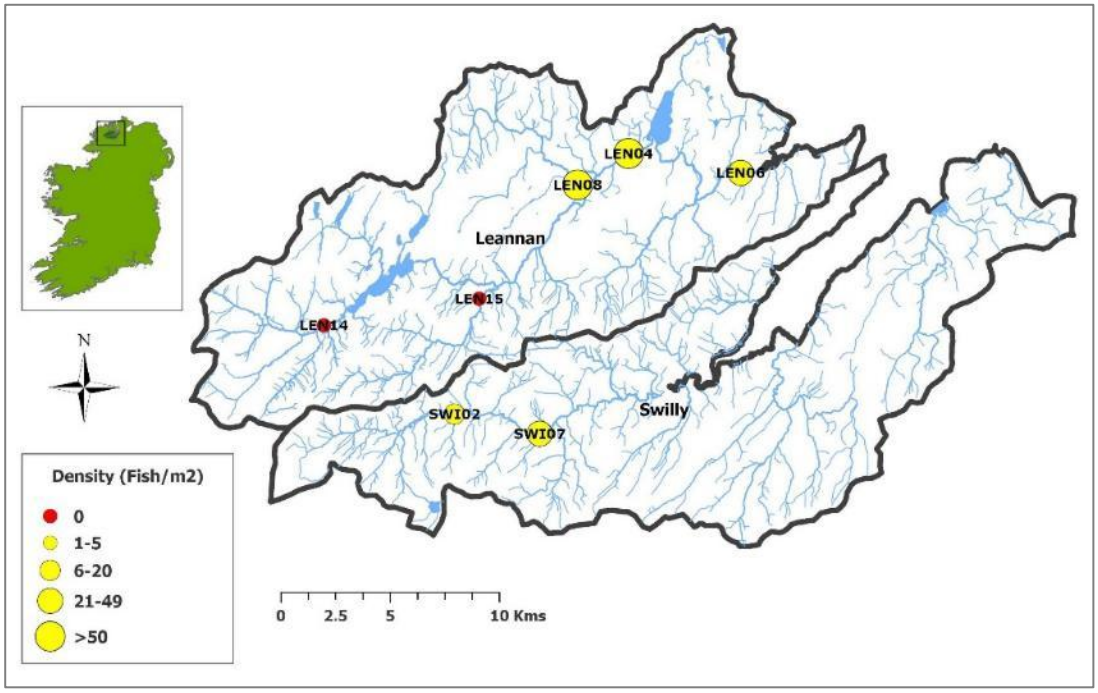


Figure 2.5. Larval *Lampetra* spp. densities at index sites on the Swilly and Lennan catchments in 2024.

Length-frequency data indicated a range of size classes across the majority of catchments (Figures 2.6 to 2.8), with lengths measuring from 14 mm (young-of-the-year larvae) to 143 mm. Sixteen *Lampetra* spp. transformers were recorded and these ranged in size from 95 mm to 143 mm.

One of the targets of the Common Standards Monitoring protocol for assessing populations of brook

and river lampreys (JNCC, 2015) is that, to achieve favourable condition, larval *Lampetra* spp. should have a mean density >5/m^2 in sites with suitable habitat within a catchment. They should also be present in not less than 50% of these sites and the full range of size classes, from 0+ to metamorphosis, should be present. In the original catchment-wide surveys favourable condition was achieved only for the Mulkear (2017). The Moy (2018), Leannan (2009), Swilly (2009) and Feale (2013) catchments had mean larval *Lampetra* densities <5/m^2 and did not achieve favourable condition. Catchment-wide data are not available for the River Brosna.

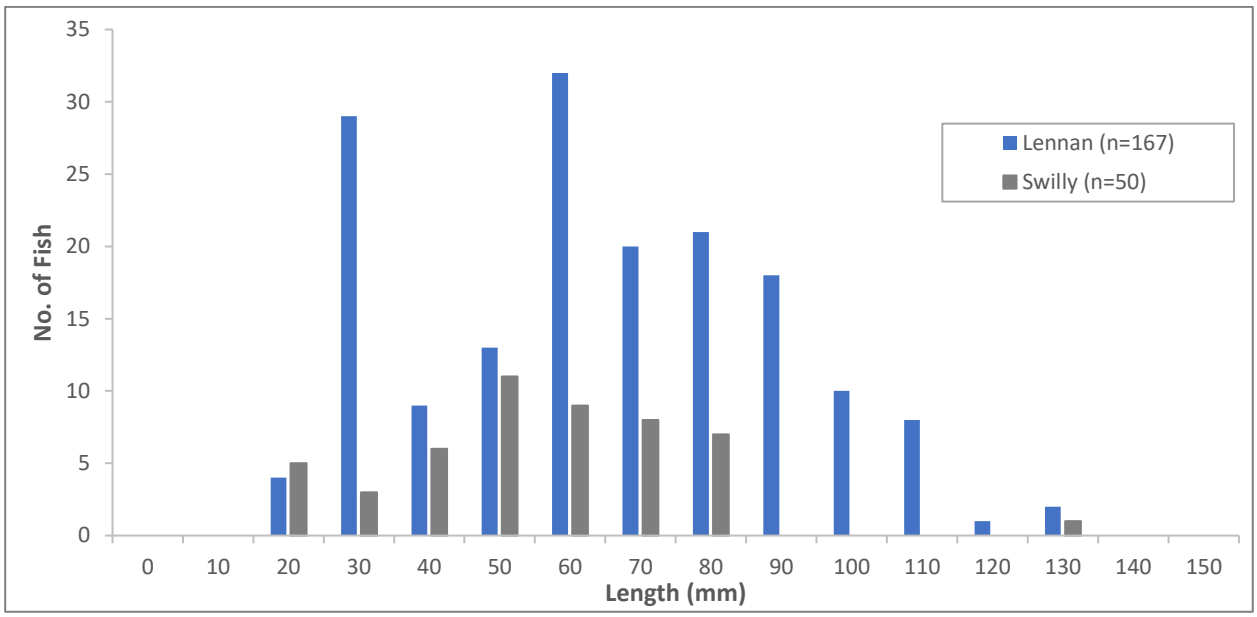


Figure 2.6. Pooled length frequency data for larval lamprey from index sites on the Lennan (n=5) & Swilly (n=2) catchments (North-Western RBD) in 2024.

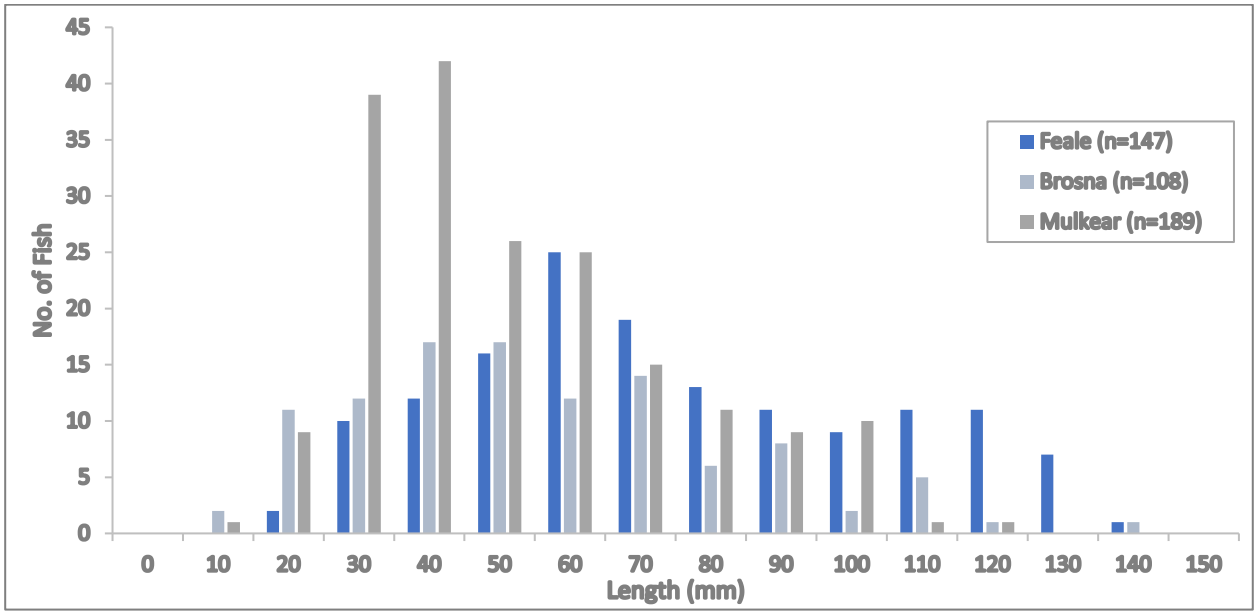


Figure 2.7. Pooled length frequency data for larval lamprey from index sites on the Feale (n=6), Brosna (n=4) & Mulkear (n=6) catchments (Shannon RBD) in 2024.

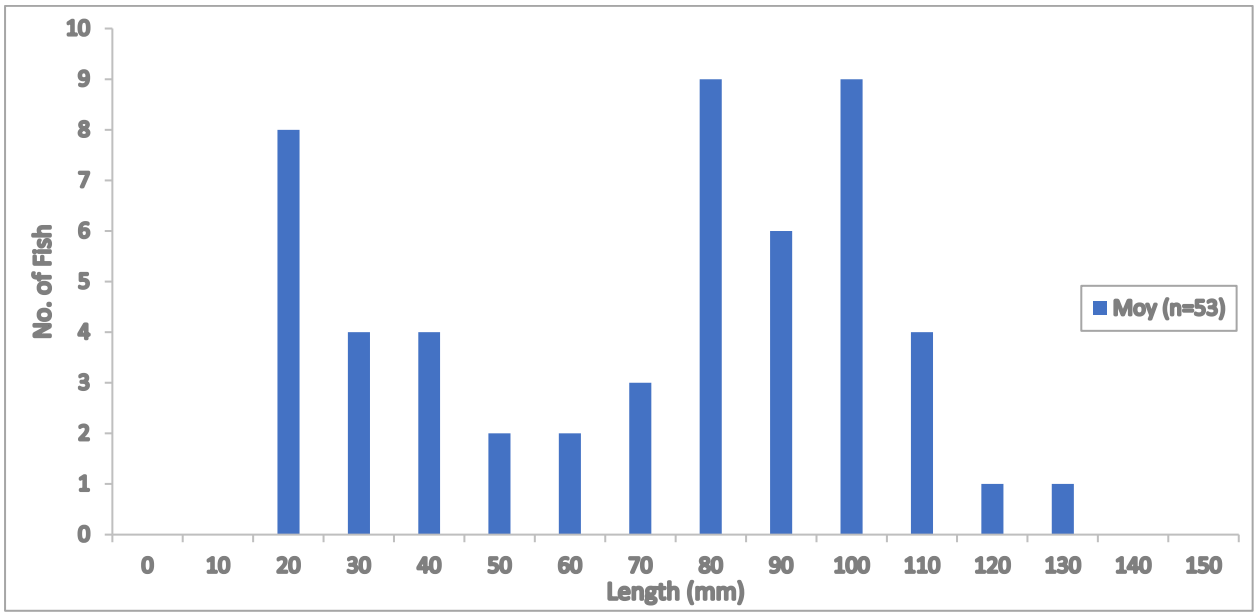


Figure 2.8. Length frequency data for larval lamprey from n=10 index sites on the Moy River (Western RBD) in 2024.

2.2 Adult Lamprey Spawning Surveys

2.2.1 River Lamprey Redd Count Surveys

River lamprey are listed in Annex II and V of the Habitats Directive and there are 10 designated Special Areas of Conservation (SACs) for this species. In the most recent reporting cycle 2013 to 2018 (NPWS, 2019), their conservation status was assessed as 'unknown' due to a deficiency of data on their distribution and population size. Challenges associated with monitoring this cryptic species include the elusive nature of their spawning activity and the short spring spawning season. This can often coincide with inclement weather and high flow conditions in rivers. In addition, the larvae of this species cannot be distinguished from those of brook lamprey and, therefore, larval lamprey surveys provide only limited data on this species. A dedicated monitoring programme for river lamprey was initiated in the current reporting cycle (2019 – 2024) involving adult spawning/redd count surveys. An additional objective is to investigate the timing and duration of the river lamprey spawning season in Ireland.

Adult river lamprey spawning surveys were undertaken on the Rivers Avoca, Boyne, Dee, Maigue, Mulkear, Slaney and Suir in 2024. The surveys targeted sites where spawning activity was previously recorded. Several locations, especially on the Avoca and Slaney, are known 'hotspots' for river lamprey spawning and are surveyed annually.

Redd count surveys were undertaken between 23rd April and 18th June 2024 however, persistent rainfall leading to high flows and high turbidity in rivers resulted in unfavourable sampling conditions (Figure 2.9). Only 12 days of surveying could be undertaken over the general spawning period. A

total of 22 sites were surveyed on between one and six occasions (Table 2.2). River lamprey redd building activity was recorded on the Rivers Dee (n=2) and Slaney (n=1), whilst adults were noted gathering below Annacotty weir on the Mulkear River during high water events in winter 2023 and spring 2024. No redds were recorded at important spawning sites on the Avoca in 2024.



Plate 2.4. River lamprey spawning habitat at the upper tidal limits of the River Maigue at Adare, Co. Limerick.

Follow-up surveys were conducted at locations across the Mulkear catchment where river lamprey spawning was detected in 2023. During 2024 there were no signs of river lamprey spawning activity noted at Killeenagarriff Bridge, Annagh Bridge or Clonsingle Bridge. Brook lamprey spawning was, however, observed at these locations, as well as at spots on the Rivers Mattock and Dee in Co. Louth. Overall, the highly reduced levels or complete absence of river lamprey spawning activity across all locations surveyed was in stark contrast to that noted from previous years, especially 2022. One possibility is that flood conditions obscured or impacted river lamprey spawning activity in the current year (Figure 2.10).



Plate 2.5. The Mattock River entering the River Boyne at Oldbridge, Co. Meath.

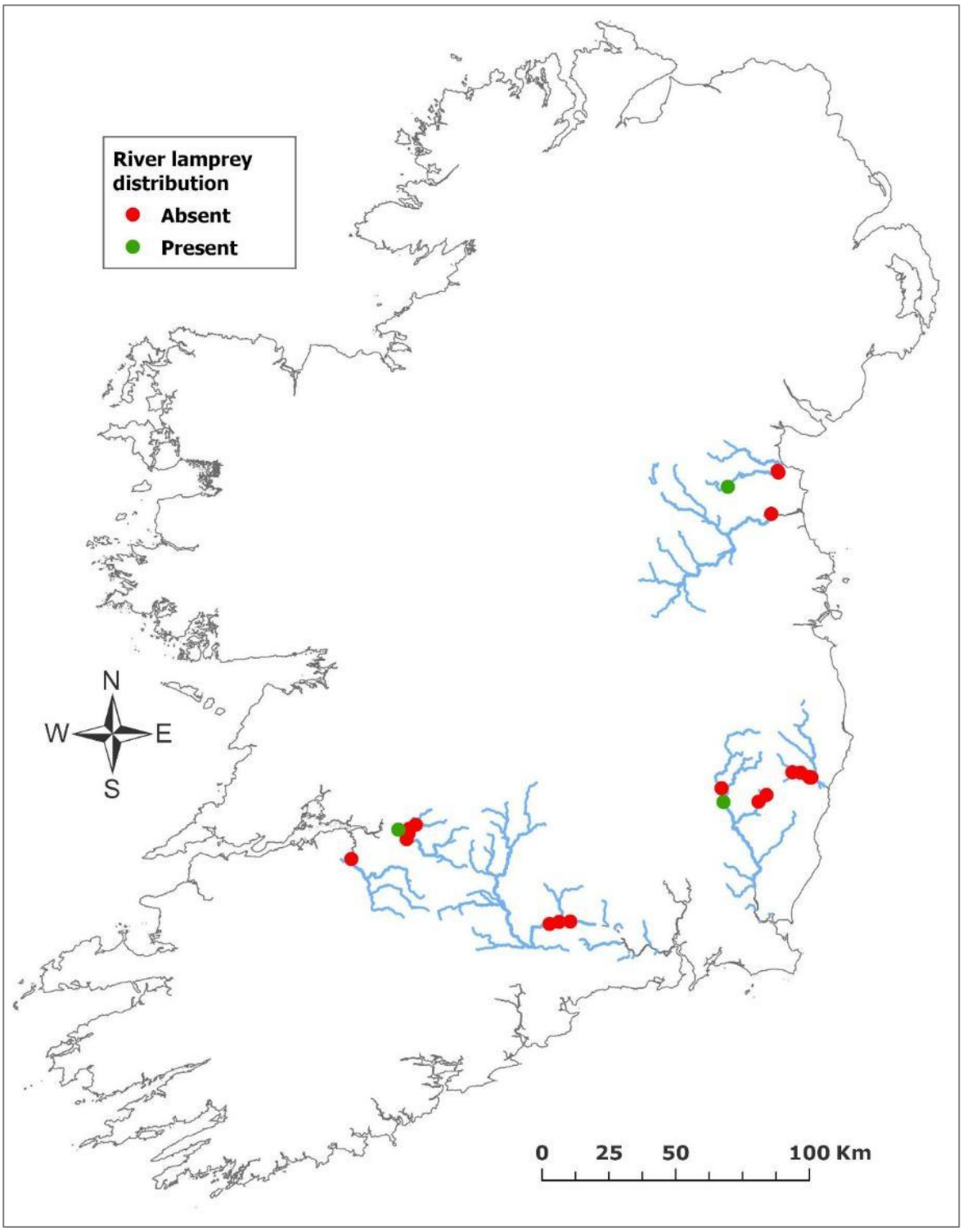


Figure 2.9. Map displaying sites surveyed for spawning river lamprey in 2024. Adult river lampreys were observed at Annacotty on the Mulkear (Lower Shannon) during the spring but no redds were recorded here

Table 2.2. River lamprey activity (presence of adult fish and redds) recorded during repeat visits to recognised spawning 'hotspots' during 2024 (* River lamprey SAC).

River	Location	No. of visits	Redds	River lamprey	Temp. Range (°C)
Avoca					
Aughrim	u/s Woodenbridge	5	Absent	Absent	10.9-14.2
Aughrim	u/s Woodenbridge (u/s weir)	2	Absent	Absent	11.5-12.6
Aughrim	Woodenbridge	6	Absent	Absent	10.9-13.9
Aughrim	Coates Bridge	6	Absent	Absent	11-14.2
Ow	u/s Aughrim	1	Absent	Absent	11.5
Boyne *					
Mattock	New Bridge	1	Absent	Absent	14.8
Dee					
Dee	Drumcar Bridge	1	Absent	Absent	
Dee	Drumcar Greenmount	2	Absent	Absent	13.6-15.1
Dee	Rockfield Bridge	1	Present	Absent	12.6
Shannon Lwr*					
Maigue	Adare Bridge	1	Absent	Absent	14.2
Mulkear	Annacotty	7	Absent	Present	10.6-14.7
Mulkear	Killeenagarriff, Annagh Br	7	Absent	Absent	11.2-15.4
Mulkear	Annagh, Clonsingle Br	6	Absent	Absent	10.6-12.6
Mulkear	Killeenagarriff, Killeenagarriff Br	6	Absent	Absent	10.7-13.3
Mulkear	Mulkear, Scart	5	Absent	Absent	10.8-13.4
Slaney *					
Slaney	1km d/s Aghade Bridge	6	Present	Absent	11.2-13
Slaney	Tullow	4	Absent	Absent	11.5
Derry	Tomnafinnoge Woods	6	Absent	Absent	10.3-14.8
Derry	Shillagh	5	Absent	Absent	11.6-14.2
Suir *					
Suir	Kilsheelan	2	Absent	Absent	11.8-13.3
Suir	Clonmel	4	Absent	Absent	11.8-15.00
Anner	Anner Br	3	Absent	Absent	10.6-13.7



Plate 2.6. River and brook lamprey spawning habitat at the upper tidal limits of the River Dee at Drumcar, Co. Louth.



Plate 2.7. River and brook lamprey spawning habitat on the Killeenagarriff River at Annagh Bridge, Co. Limerick.

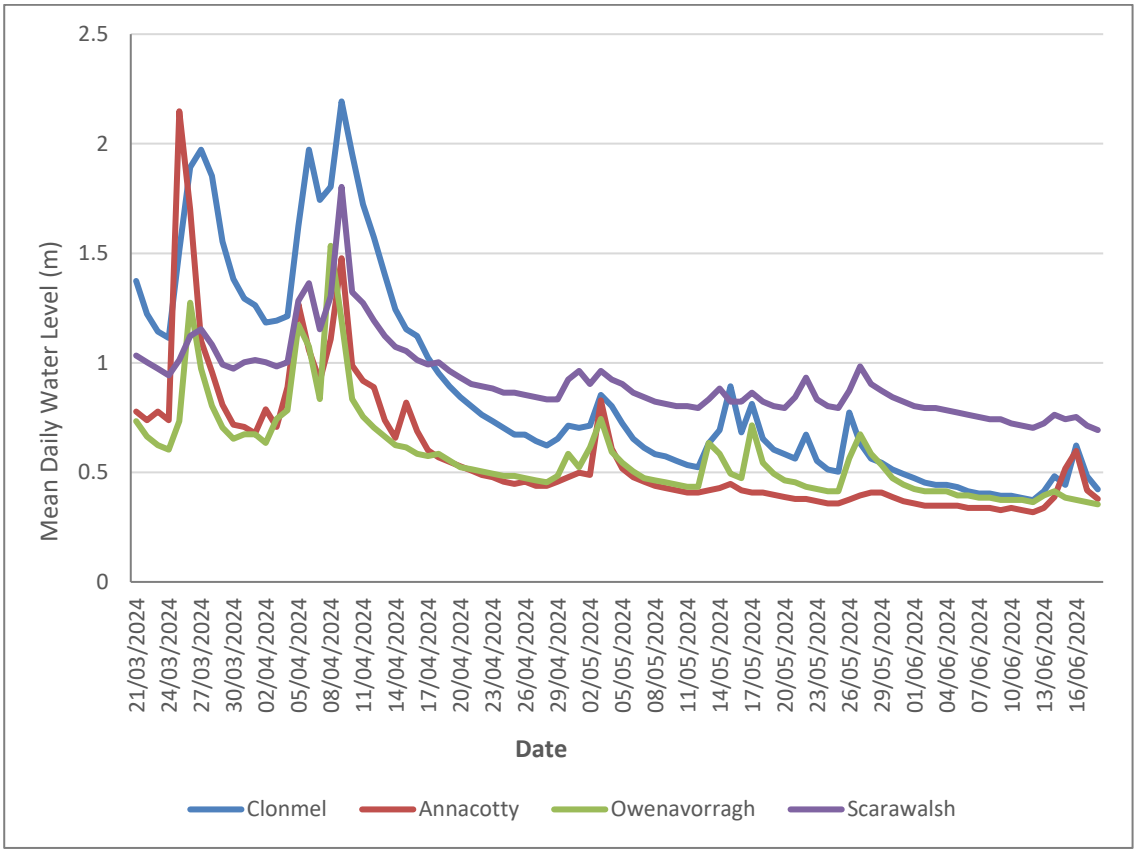


Figure 2.10. OPW water level data 21/03/2024 to 18/06/2024 at river lamprey spawning locations.

2.2.2 Sea Lamprey Redd Count Surveys

Annual surveys at sea lamprey spawning 'hotspots' continued in 2024. Site visits, typically repeated, were undertaken from early May (9th) through to early July (11th) at established spawning sites on

individual SAC rivers across the south and southeast, as well as within the Lower Shannon SAC (Figure 2.11), with the aim of recording timing, extent, and annual consistency of breeding effort. Details of hotspot visits as well as results are listed in Table 2.3. It is noteworthy that many of these hotspots are located downstream of manmade barriers, for instance Annacotty, Clonmel, St. Mullins and Ennis.



Plate 2.8. Annacotty Weir on the Mulkear River, Co. Limerick.

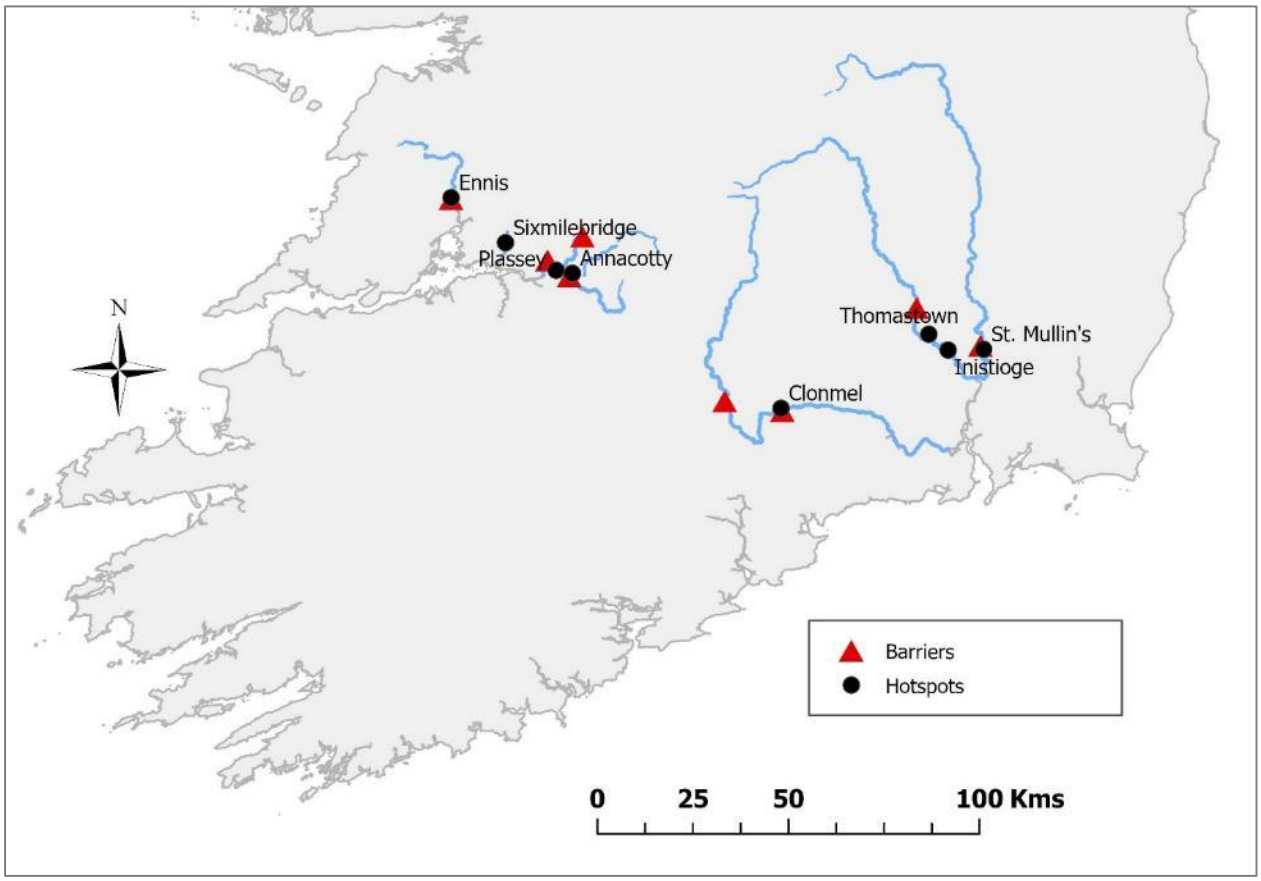


Figure 2.11. Location of principal sea lamprey spawning 'hotspots' surveyed annually.

One major observation during 2024 was an apparent collapse in numbers of redds typically observed at Annacotty on the Mulkear River, Co. Limerick. This notable spawning hotspot was visited on 9 occasions from mid-May (14th) to early-July (11th) 2023. The first visit on May 14th confirmed that spawning had commenced with a single observed adult engaged in nest-building activity (Table 2.3). Subsequent visits during May and June revealed a paucity of redds in comparison with previous years, with a total of 14 redds recorded by the end of surveying. Visits were extended into July to allow for a possible late spawning run which might boost numbers towards more normal levels. This, however, failed to materialise and the final count of 14 redds was between 10 and 20% of the total typically seen and expected for this location from year to year. In 2023 for instance, a minimum of 70 nests were counted before redd superimposition and merging of adjacent excavations in super-redds rendered further accurate counting impossible. Surveying in following years will reveal if this decrease is a once-off anomaly or a more ominous sign of a significant downward trend in the population. Water levels and temperatures at Annacotty and Clonmel for the spawning period are displayed in Figure 2.12 & Figure 2.13, respectively.

Lower than expected numbers were noted at other hotspot locations around the Lower Shannon area. A total of 15 redds were recorded from the River Fergus in Ennis town over 2 visits, in comparison to 45 redds counted in 2023. At Sixmilebridge on the River Owenogarney, a total of 6

redds were counted, broadly comparable to previous years. However, no redds were recorded from the main channel River Shannon at Plassey in the grounds of the University of Limerick.



Plate 2.9. Sea lamprey redds on the River Fergus at Mill Road Bridge, Ennis, Co. Clare.

The Clonmel town section of the River Suir was visited on 7 occasions during the sea lamprey spawning season with moderate numbers of redds (n=9) counted. Low numbers were also noted on the River Nore at Inistioge (n=3) and Thomastown (n=3). In contrast, the River Barrow at St. Mullins had extremely healthy numbers of redds with a total of 63 recorded over 5 separate visits.



Plate 2.10. Sea lamprey spawning hotspot on the River Suir, Clonmel, Co. Tipperary.

Several locations on upstream tributaries throughout the greater Mulkear catchment in Cos. Limerick and Tipperary exist where spawning is recorded almost annually for some, and less frequently for others. During 2023, redds were recorded at locations such as Scart, Killeenagarriff Bridge, Annagh

Bridge and Clonsingle Bridge. These sites were revisited on 6 occasions in 2024 to assess successful upstream migration beyond the obstacle to passage imposed by Annacotty Weir. No evidence of spawning activity was detected at any of the locations surveyed.

Sea lampreys were also noted from other locations around the country including a redd on the River Maigue at Adare and dead lamprey reported from the River Boyne at Oldbridge, Co. Meath and the River Moy in Ballina, Co. Mayo.

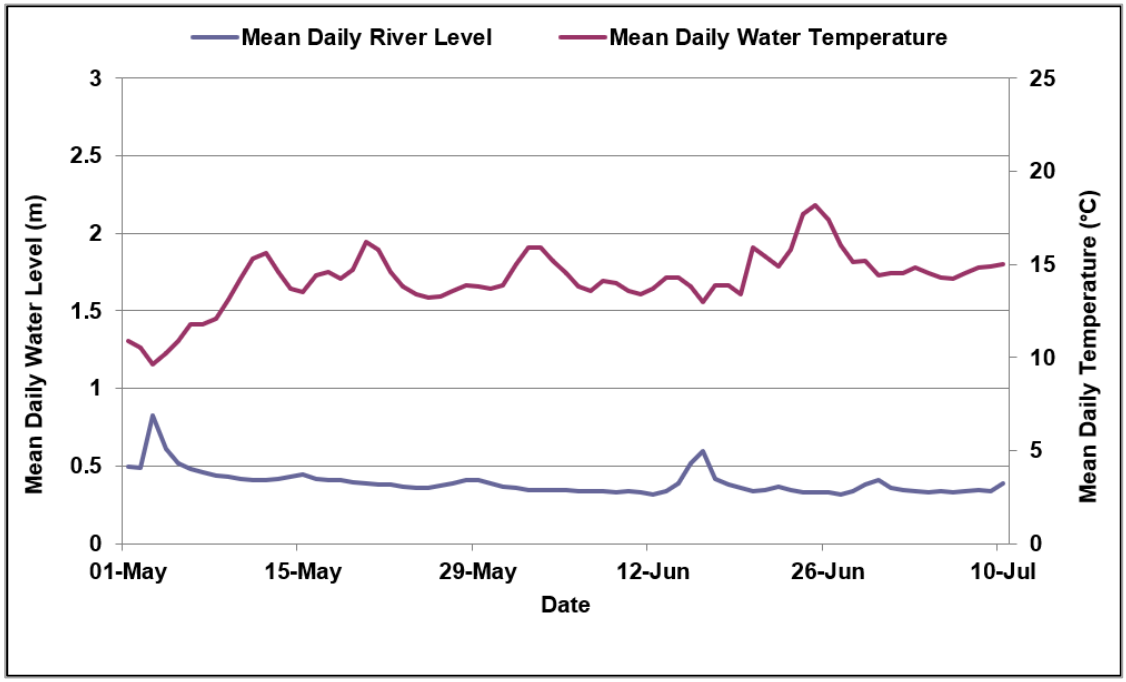


Figure. 2.12. Mulkear River levels and water temperatures measured at Annacotty (OPW hydrometric gauging station #25001) during the 2024 sea lamprey migration and spawning period.

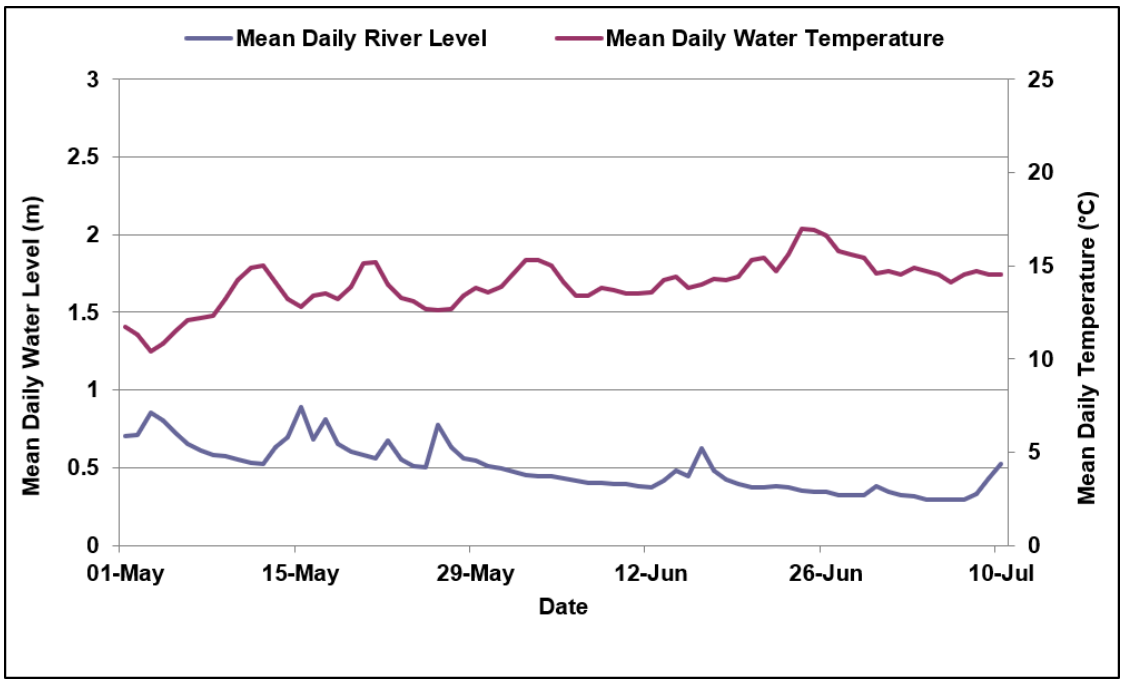


Figure 2.13. River Suir levels and water temperatures measured in Clonmel town (OPW

hydrometric gauging station 16011) during the 2024 sea lamprey migration and spawning period.



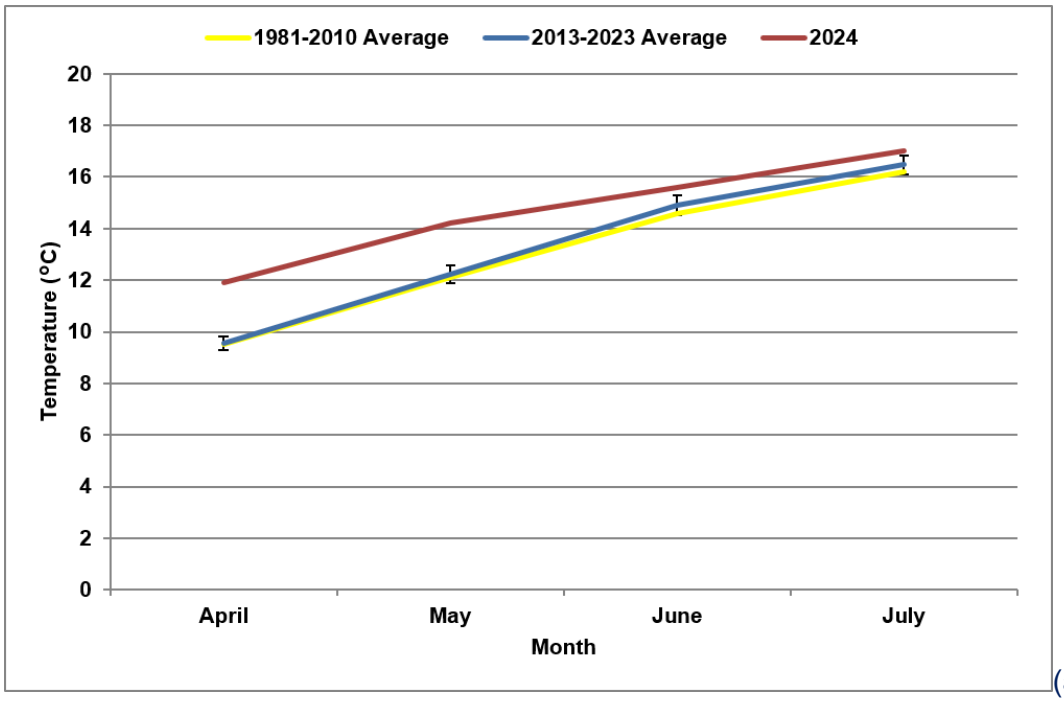
Plate 2.11. Sea lamprey at Annacotty on the River Mulkear.

Table 2.3. Sea lamprey activity (counts of adult fish and redds) recorded during repeat visits to recognised spawning hotspots during 2024.

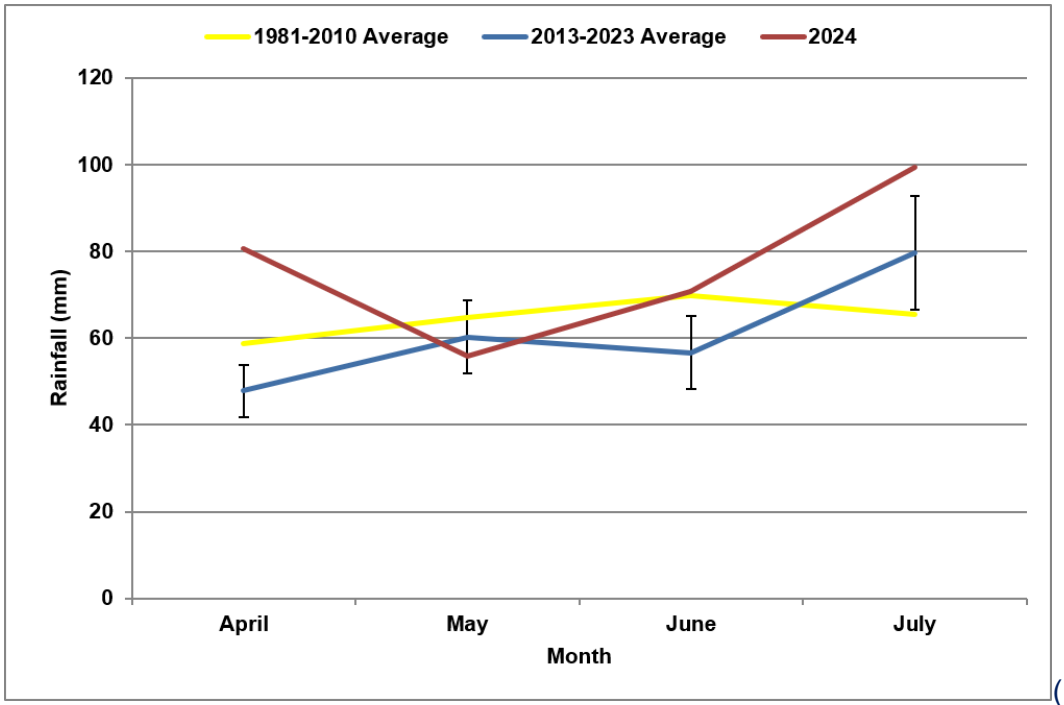
Date	Location	Sea Lamprey	Redds	Temp (°C)
12/06/2024	River Fergus, Ennis Town,	2	12	16.9
26/06/2024	Co. Clare	0	15	18.7
27/05/2024	River Maigue, Adare, Co. Limerick	0	1	14.2
14/05/2024	Mulkear River, Annacotty,	1	1	13.3
23/05/2024	Co. Limerick	0	3	13.4
27/05/2024		0	5	13.3
5/06/2024		0	8	14.7
12/06/2024		0	9	14.4
20/06/2024		0	12	14.4
26/06/2024		1	14	17.7
2/07/2024		0	14	14.7
11/07/2024		0	14	15.4
5/06/2024	River Shannon, UL Living Bridge,	0	0	16.7
10/06/2024	Plassey, Co. Limerick	0	0	16.8
2/07/2024		0	0	17.8
12/06/2024	Owengarney River, Sixmilebridge	0	4	17.3
2/07/2024	Co. Clare	0	6	16.9
9/05/2024	River Suir, Clonmel,	0	0	12.8
21/05/2024	Co. Tipperary	0	0	15.0
6/06/2024		0	6	13.2
20/06/2024		0	6	16.9
27/06/2024		0	7	16.1
3/07/2024		0	8	15.6
16/07/2024		0	9	15.4
11/06/2024	River Nore, Thomastown,	0	1	14
27/06/2024	Co. Kilkenny	0	1	16.1
16/07/2024		0	3	15
11/06/2024	River Nore, Inistioge,	0	1	13.8
27/06/2024	Co. Kilkenny	0	2	16.8
16/07/2024		0	3	15.8
31/05/2024	River Barrow, St. Mullins,	0	10	14.2
7/06/2024	Co. Carlow	8	29	15.4
20/06/2024		6	55	16.3
5/07/2024		4	71	16.3
17/07/2024		0	71	15.9

Prevailing weather conditions for the entire period both before and during the sea lamprey spawning run were obtained from the Met Eireann synoptic weather station at Shannon Airport, Co. Clare, the data from which should be broadly representative of the Lower Shannon area where most ‘hotspots’

are located. Air temperatures in April and May 2024 were slightly warmer than average (Figure 2.14a), accompanied by heavy rainfall events in January, February and March which resulted in elevated river levels and coloration in early April (Figure 2.14b). For the most part, sea lamprey redd surveying during 2024 was unimpeded by inclement weather.



(a)



(b)

Figure 2.14. Monthly mean air temperatures (a) and total rainfall (b) from April 2024 to July 2024 recorded at Shannon Airport (Met Eireann) in comparison with both the 30-year (1981-2010) long-term average (LTA) and the preceding 11-year (2013-2023) average.

3. Shad Monitoring Programme

3.1 Juvenile Shad Survey

3.1.1 Shad Egg Surveys

Four Special Areas of Conservation (SACs) are designated for twaite shad (*Alosa fallax*) in Ireland. These are located along the south and south-east coasts and include the estuaries of the Slaney, Barrow-Nore, Suir and Munster Blackwater. Shad egg surveys are an effective technique for determining the timing and spatial extent of spawning activity (JNCC, 2015) and have been carried out since 2017, as part of the monitoring programme for this species. All four SACs have been surveyed and, to date, shad (*Alosa* sp.) eggs have been recorded from the Barrow (St. Mullins), Nore (Inistioge), Suir (Carrick-on-Suir) and Munster Blackwater (Lismore) but not from the Slaney.

St. Mullins, located at the upper tidal limit of the Barrow, is well known for its annual run of twaite shad. Spawning occurs below a weir which acts as a substantial, if not complete, barrier to upstream migration. St. Mullins has been the focus of intensive surveying for shad eggs during April to July in 2021 and 2022 over an 11-week and 15-week period, respectively, and during April to June 2023 over an 11-week period. The River Suir also has an adult shad run and a spawning site was identified in 2022 at the top of the tidal influence (upstream of Carrick-on-Suir). This site was sampled from April to July in 2022 and April to late June in 2023, both over a 10-week period. Egg count surveys continued at the Barrow and Suir spawning locations in 2024, with surveying commencing slightly later than previous years (mid to late April) due to high flow conditions.



Plate 3.1. Spawning location for twaite shad at the upper tidal limits of the River Barrow at St. Mullins.

Increasing water temperature is an important environmental cue for spawning behaviour and the literature states that eggs develop successfully in the range of 15°C to 25°C. Spawning in Irish rivers has been recorded in the zone of tidal influence over substrates characterised by coarse sand,

gravels, cobbles and boulders. The eggs are clear, non-adhesive, semi-buoyant and range in diameter from 1.5 – 5 mm (usually 2.4 mm). Eggs and sperm are broadcast into the water column with the majority of eggs sinking to the riverbed and remaining in crevices until they hatch 3 – 5 days later.

Samples were collected by kick-sampling for 15 seconds upstream of a hand-held macroinvertebrate net (250 µm mesh) and during low tide conditions. At each site, samples were taken working upstream to avoid re-recording eggs dislodged from an earlier kick sample. Gravels and plant material from each net were sorted by hand and the presence/absence of eggs was recorded. Water levels were variable throughout the spawning period. As stated, sampling commenced later in 2024 compared with the previous years due to higher river flows in March and April. Rainfall was above average nearly everywhere during March and April and was wettest in the south and east of the country. By contrast, in May, June and July, total monthly rainfall at Oak Park weather station was below the Long-Term Average (LTA) for each of these months. The monthly river flows during March, April and May were considerably above average for both the River Barrow (170%, 207% and 136% of the long-term monthly average respectively) and the River Suir (183%, 193%, 114% respectively), while, during June and July, river flows were below average for both the Barrow (91%, 90% of the long-term monthly average respectively) and the Suir (82% and 70% respectively) (Monthly reports available at https://www.epa.ie/publications/monitoring--assessment/freshwater--marine/hydrology-bulletin/).



Plate 3.2. Kick-sampling for twaite shad eggs on the River Suir upstream of Carrick-on-Suir.

Weekly sampling occurred downstream of the weir at St. Mullins on the River Barrow over a 15-week period from 19th April to 24th July 2024. Riverbed material consisted of a mixture of cobbles, gravels and coarse sand. Eggs were first recorded on 25th April (n=33) and continuously for a 12-week period up to the second week of July (Table 3.1 & Figure 3.1). The total number of eggs

recorded during the survey period was n=874, with the highest count (n=314) occurring on 17th May. Water temperatures during the survey period ranged from 10.7°C to 17.6°C. The temperature was 11.8°C on the day when eggs were first encountered and 14.7°C when the highest egg count was recorded. Mean daily water levels (Table 3.1 & Figure 3.2) at the OPW hydrometric station at Graiguenamanagh ranged from 0.43 m (5th July) to 0.67 m (19th April).

Table 3.1. Shad egg data for St. Mullins in 2024 with water temperature (observed on day of sampling) and water level (OPW Hydrometric Station at Graiguenamanagh).

Date	No. Eggs	Moon phase	Water Temp (°C)	Water level (m)
19/04/2024	0	Waxing Gibbous	10.7	0.67
25/04/2024	33	Waning Gibbous	11.8	0.60
03/05/2024	30	Waning Crescent	10.8	0.64
10/05/2024	285	Waxing Crescent	15.7	0.56
17/05/2024	314	Waxing Gibbous	14.7	0.56
24/05/2024	45	Full Moon	14.4	0.53
31/05/2024	96	Third Quarter	14.2	0.53
07/06/2024	21	New Moon	15.4	0.48
14/06/2024	5	First Quarter	14.3	0.47
20/06/2024	41	Waxing Gibbous	16.3	0.46
27/06/2024	1	Waning Gibbous	17.6	0.45
05/07/2024	1	Waning Crescent	16.3	0.43
11/07/2024	2	Waxing Crescent	16.5	0.47
17/07/2024	0	Waxing Gibbous	15.9	0.45
24/07/2024	0	Waning Gibbous	17.6	0.48

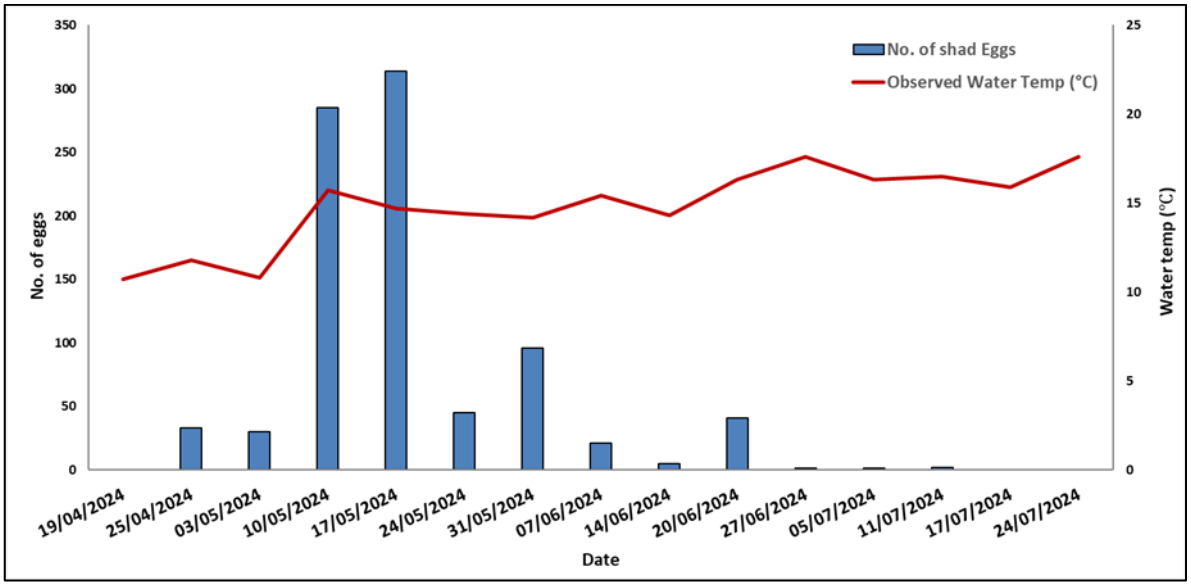


Figure 3.1. No. of shad eggs recorded at St. Mullins (River Barrow) in 2024 with accompanying water temperature data (observed on day of sampling).

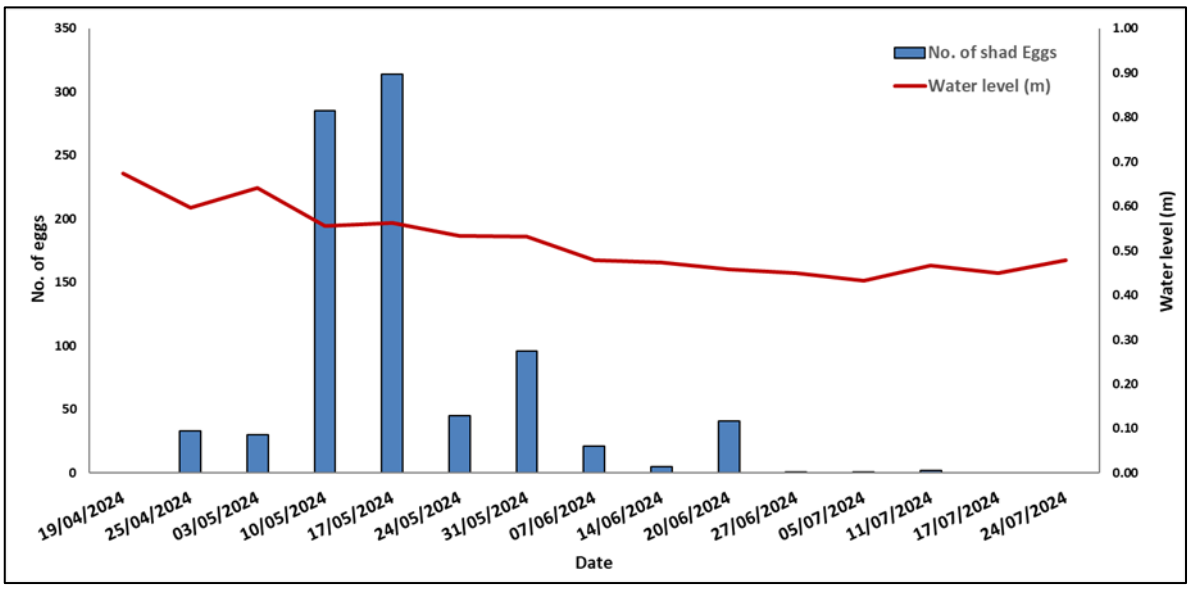


Figure 3.2. No. of shad eggs recorded at St. Mullins (River Barrow) in 2024 with accompanying water level data recorded from the OPW station at Graiguenamanagh

Sampling was carried out at the River Suir site over a 9-week period from 25th April to 3rd July 2024, however, only two surveys were carried out in the first four weeks (see Date Table 3.2), due to high water levels. Eggs (total n=53) were first recorded on 21st May (water temperature 15.3°C) and consecutively for 5 weeks up to the 20th June. The highest count (n=31) occurred on 30th May when the water temperature was 14.1°C (Figure 3.3). Mean daily water levels (Table 3.2 & Figure 3.4) at the OPW hydrometric station at Clonmel ranged from 0.31 m (3rd July) to 0.67 m (25th April).

The shad egg surveys on the Rivers Barrow and Suir during 2022, 2023 and 2024 are shedding light on the spawning behaviour of twaite shad in Irish SACs. Results have revealed that spawning commences earlier than expected and at lower water temperatures than stated in the literature. In addition, spawning appears to be continuous throughout the season rather than restricted to one or two events as previously assumed.

Table 3.2. Shad egg data for River Suir sites in 2024 with water temperature (observed on day of sampling and water level (OPW Hydrometric Station at Clonmel).

Date	No. Eggs	Moon phase	Water Temp (°C)	Water level (m)
25/04/2024	0	Waning Gibbous	11.9	0.673
09/05/2024	0	Waxing Crescent	14.4	0.573
21/05/2024	3	Waxing Gibbous	15.3	0.563
30/05/2024	31	Third quarter	14.1	0.513
06/06/2024	13	New Moon	14.2	0.413
12/06/2024	2	Waxing Crescent	15.3	0.373
20/06/2024	4	Waxing Gibbous	16.2	0.373
26/06/2024	0	Waning Gibbous	17.7	0.343
03/07/2024	0	Waning Crescent	15.7	0.313

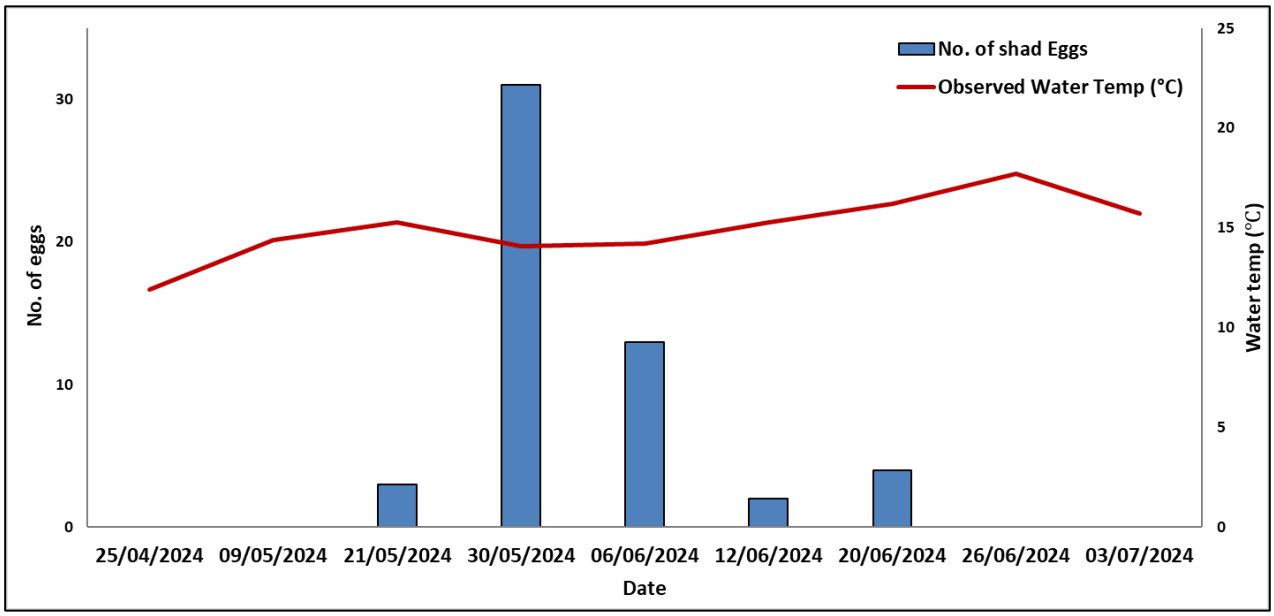


Figure 3.3. No. of shad eggs recorded at River Suir site in 2024 with accompanying water temperature data (observed on day of sampling).

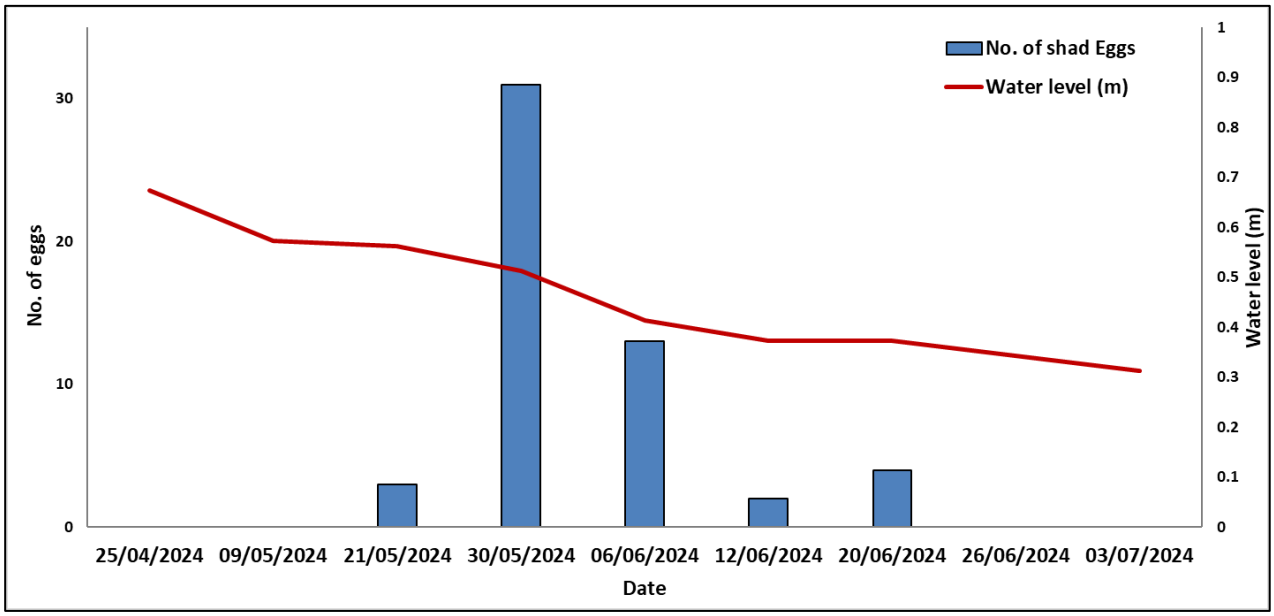


Figure 3.4. No. of shad eggs recorded at River Suir Site in 2024 with accompanying water level data recorded from the OPW station at Clonmel.

3.1.2 Beach seine netting surveys August 2024

As part of IFI's National Bass Conservation Programme, a seine netting survey for juvenile bass (*Dicentrarchus labrax*) was carried out on the Slaney estuary, a designated SAC for twaite shad (Slaney River Valley SAC). A Collins seine net was used to carry out the survey. This net measured 30.8 m x 2 m with a 14 mm mesh size and a 5 m central panel with a 6.5 mm mesh. This net was deployed by boat in an arc shape and slowly drawn to shore with 30 m warps on each side of the net. Ten seine net samples were taken in the Slaney Estuary on the 20th August 2024. Mean salinity was 26.3 ppt with a mean water temperature at 19.2°C across the ten net hauls. No twaite shad were recorded during this survey.



Plate 3.3. Trawling survey, Duncannon, Waterford Harbour.

3.1.3 Trawling Surveys

The fish communities in three Irish estuaries were surveyed *via* trawled transects in August & September 2024. These surveys are conducted annually primarily to provide data for IFI's National Bass Programme. Species of interest to the Habitats Directive Monitoring Programme, namely *Alosa* sp., smelt and lampreys, are also occasionally encountered. Repeat surveys for 2024 were undertaken on the Barrow-Suir Estuary, the Slaney Estuary and the Munster Blackwater Estuary from the 21st August - 3rd September. Towed transect trawling was undertaken by a commercial trawler and crew with IFI staff also on board to process catches and record data.

Barrow-Suir Estuary Trawling Survey

Trawling surveys on the Barrow-Suir Estuary / Waterford Estuary took place over two days (August 21st & 22nd 2024). A total of 18 trawls were undertaken in the lower Barrow and Suir Estuary at locations including Great Island, Passage East and Duncannon (Figure 3.5). Mean water temperature recorded across the 18 trawls was 17.3°C (range 16.1–18.7°C). Depth of the water

column recorded across each trawl varied from 1.2–10.9 m (average 3.6 m) with an average of 11 minutes per trawl (range 4–20 mins) while trawling occurred predominantly across ebbing tides. Mean salinity was recorded as 25.5 ppt (range 8.2–32.8 ppt). Trawling occurred predominantly across ebbing tides over the two survey days. A total of nine shad with total lengths ranging from 110–205 mm were captured over both survey days.

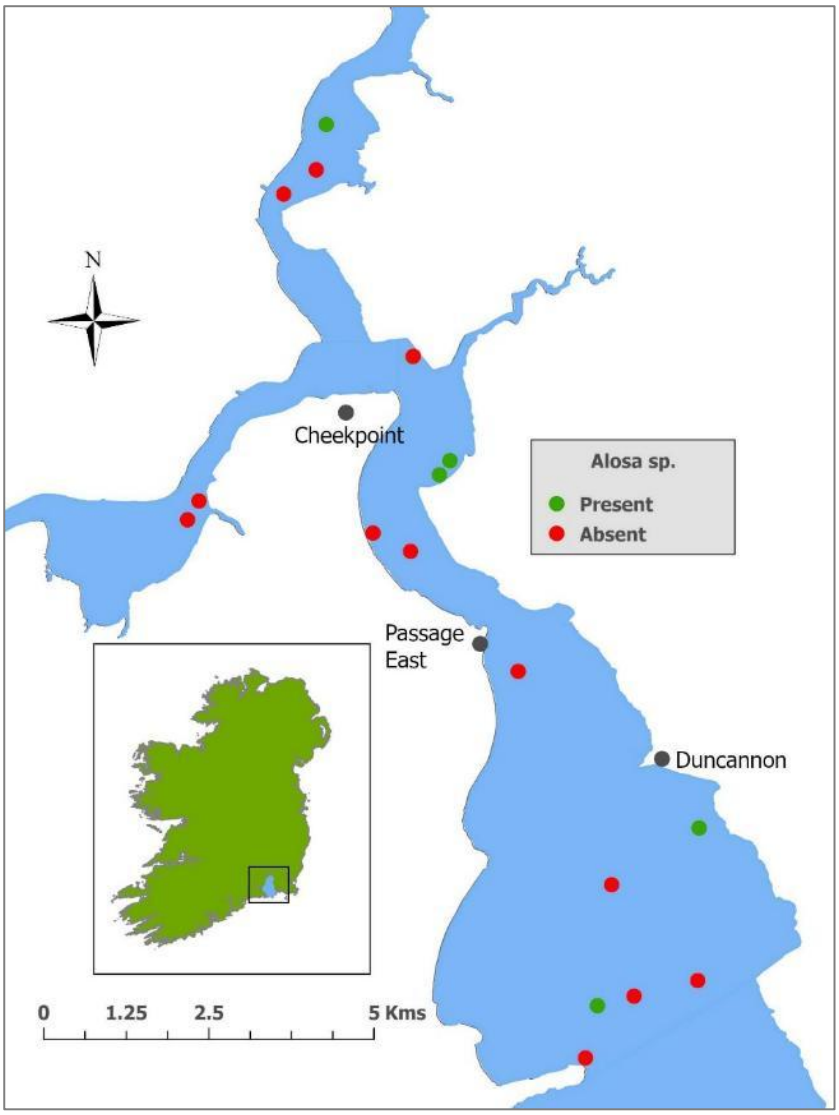


Figure 3.5 Incidence of capture of shad (n=9) during the trawling survey transects (n=18) on the Barrow-Suir/ Waterford Estuary in August 2024.

Lower Slaney Estuary Trawling Survey

Trawling surveys on the Lower Slaney Estuary were undertaken on the 28th and 29th of August 2024. A total of 13 trawls took place over both days (Figure 3.6) with an average of 10 minutes per trawl (range 5-16 mins). Water temperatures ranged from 16.5–18.9°C across all 13 trawls with an average of 17.4°C. Mean salinity was recorded as 24.3 ppt (range 16.3–33.2 ppt). Depth of the water column across sampling sites varied from 1.0–6.3 m (average 3 m) while trawling occurred

predominantly across flooding tides. A total of eight shad with total lengths ranging from 165–390 mm were captured in four of the 13 trawls undertaken over both survey days (Figure 3.6).

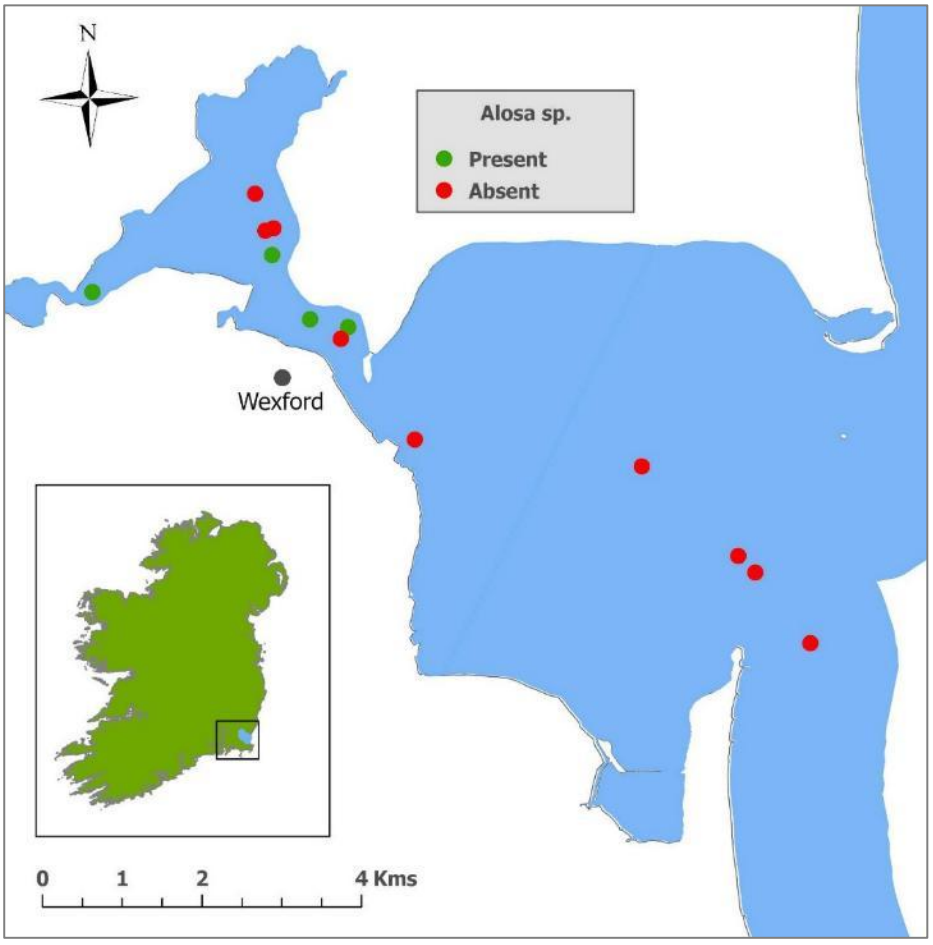


Figure 3.6. Incidence of capture of shad (n=4) during the trawling survey transects (n=13) on the Slaney Estuary in August 2024.

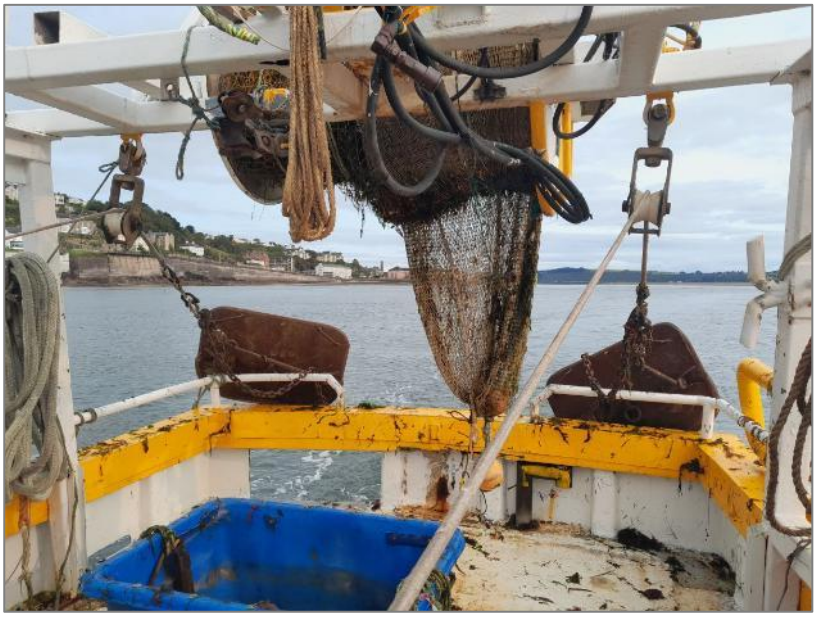


Plate 3.4. Trawling survey in Youghal Harbour, Co. Cork.

Munster Blackwater Trawling Survey

Trawling surveys on the Munster Blackwater took place over two days (September 2nd & 3rd). A total of 17 trawls were undertaken (Figure 3.7) across both days (average of 11 minutes per trawl, range 7-20 mins). Trawling on 2nd September was undertaken on a predominantly flooding tide while trawling on September 3rd occurred on a combination of flooding and ebbing tides. The trawl locations stretched from the outer mouth of the estuary at Youghal Harbour to Ballinaclash in the mid-tidal section of the river (Figure 3.7). Mean water temperature recorded across the 17 trawls was 16.7°C (range 16.1–17.9°C). Depth of the water column recorded across each trawl varied from 1.9 m to 5.6 m. Mean salinity was recorded as 22.4 ppt (range 6.7–33.6 ppt). A total of six shad with total lengths ranging from 142 mm–178 mm were captured in five of the 17 trawls carried over both survey days.

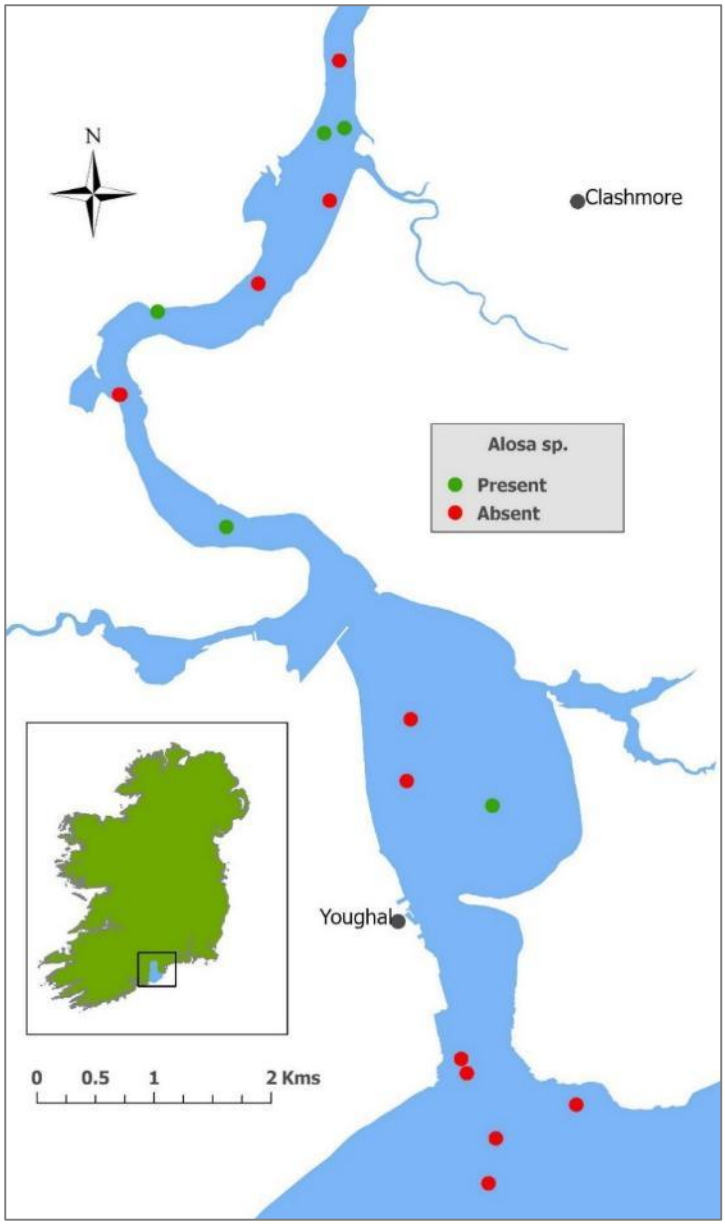


Figure 3.7. Incidence of capture of shad (n=5) during the trawling survey transects (n=17) on the Lower Munster Blackwater Estuary in September 2024.

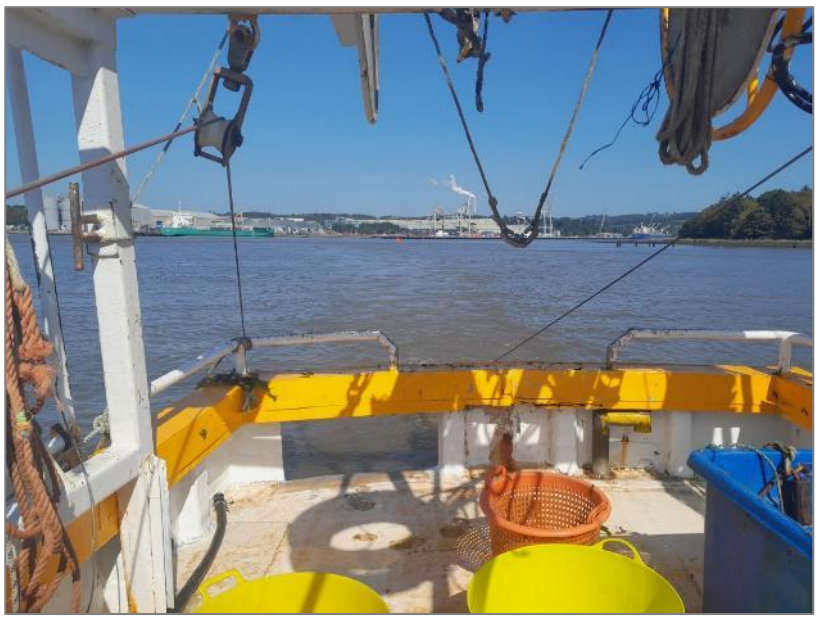


Plate 3.5 Trawling survey at King's Island & Port of Waterford, River Suir Estuary

3.1.4 WFD Surveillance of Transitional Waters – October 2024

IFI carries out surveillance monitoring of fish in transitional waters under the Water Framework Directive. This monitoring programme is carried out on the Barrow-Nore, Suir complex on a 3-year rolling programme and was sampled from 23rd September to 9th October 2024. The standardised method for sampling fish in transitional waters in Ireland for the WFD monitoring programme is a multi-method approach using various netting techniques:

- Beach seining using a 30 m fine-mesh (10 mm) net to capture fish in littoral areas
- Beam trawling for specified distances (200 m) in open water areas adjacent to beach seining locations
- Fyke nets set overnight in selected areas

Of the 3 netting techniques used in this survey, juvenile shad were captured from the beach seines and fyke nets. They were recorded in 7 out of 42 seine nets, 1 out of 32 fyke nets and 0 of the beam trawlings sampled stretching from the mouth of the estuary to the upper estuarine stretches. A total of 12 shad were captured across all net samples in 2024 (Figure 3.8).

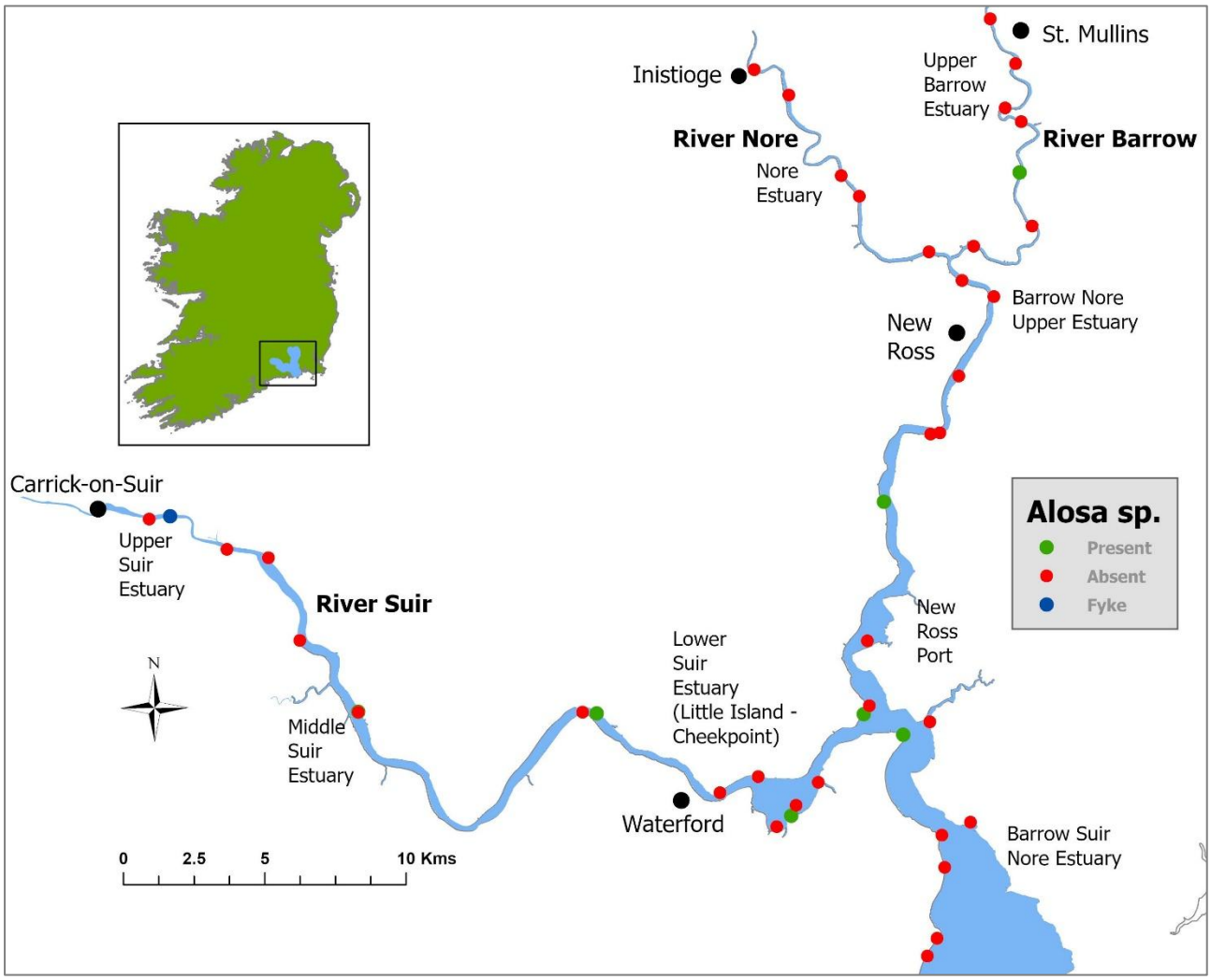


Figure 3.8. Seine net results for juvenile shad as part of the WFD surveillance monitoring of the Barrow-Nore and Suir transitional waters October 2024; the only shad presence in a fyke net is also shown.

Fish lengths ranged from 66 – 185 mm (Figure 3.9). The New Ross Port site captured the largest number of fish (n=4) (Figure 3.9). The largest fish was caught in the Lower Suir estuary measuring 185 mm. No shad were captured in the Nore Estuary and Barrow Nore Estuary Upper sections (Figure 3.8).

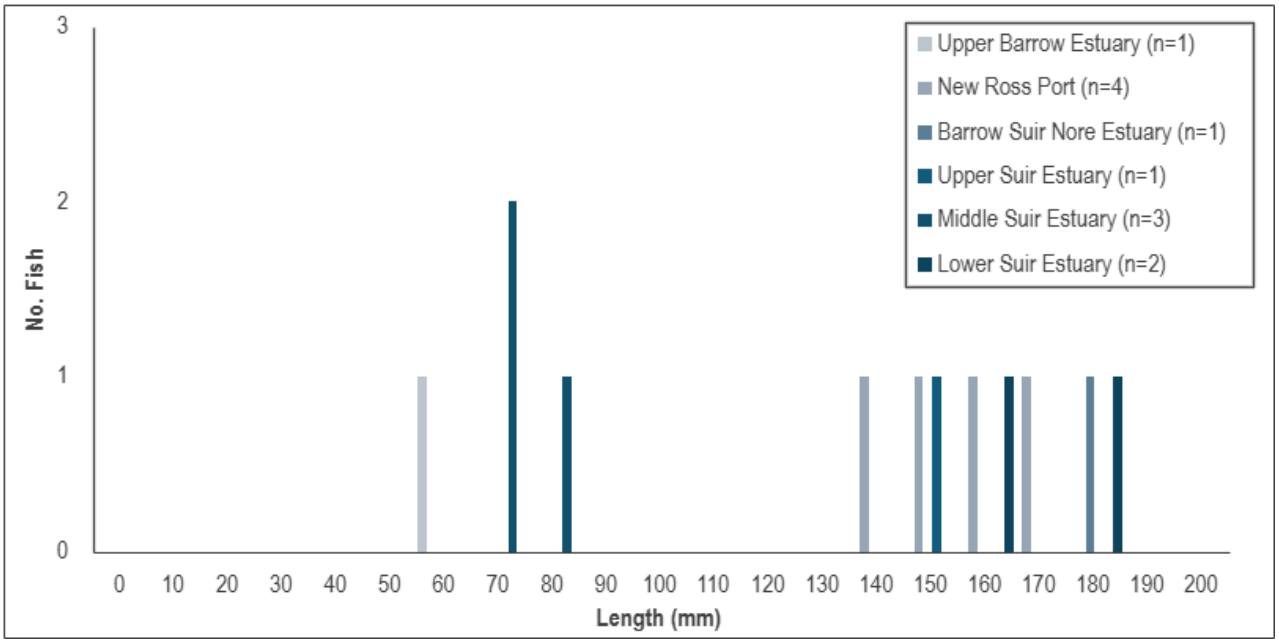


Figure 3.9. Length frequency of juvenile shad from WFD surveillance monitoring of the Barrow-Nore and Suir transitional waters October 2024.

4. Smelt Monitoring Programme

4.1 Juvenile Smelt Programme

Seine netting surveys August 2024

A beach seining survey of the Slaney estuary was carried out by the Bass Conservation Programme in 2024. A Collins seine net was used to carry out the survey. This net measured 30.8 m x 2 m with a 14 mm mesh size and a 5 m central panel with a 6.5 mm mesh. This net was deployed by boat in an arc shape and slowly drawn to shore. All species of fish that were captured were counted and measured on site. Ten seine net samples were taken in the Slaney Estuary on the 20th August. Mean salinity was 26.3 ppt with a mean water temperature at 19.2°C across the ten net hauls. No smelt were captured during this survey.

Trawling surveys

The fish communities in the Barrow-Suir Estuary, the Slaney Estuary and the Munster Blackwater Estuary were surveyed *via* trawled transects from the 21st August - 3rd September, as outlined in Chapter 3. No smelt were captured during the 2024 trawling surveys (Table 4.1).

Table 4.1. Trawling surveys locations as part of the Bass Conservation Programme in August - September 2024.

Estuary	Date	No. Hauls	Mean Salinity (ppt)	Mean Water Temp (°C)	No. Smelt
Barrow	21-22/08/2024	18	25.5	17.3	0
Slaney	28-29/08/2024	13	24.3	17.4	0
Munster Blackwater	02-03/09/2024	17	22.4	16.7	0

WFD Surveillance of Transitional Waters – October 2024

IFI carries out surveillance monitoring of fish in transitional waters under the Water Framework Directive. This monitoring programme is carried out on the Barrow-Nore, Suir complex on a 3-year rolling programme and was sampled from 23rd September to 9th October 2024. The standardised method for sampling fish in transitional waters in Ireland for the WFD monitoring programme is a multi-method approach using various netting techniques:

- Beach seining using a 30 m fine-mesh (10 mm) net to capture fish in littoral areas
- Beam trawling for specified distances (200 m) in open water areas adjacent to beach seining locations
- Fyke nets set overnight in selected areas

A total of 14 smelt were captured from the Barrow, Nore and Suir estuaries in 2024 using the WFD netting methodologies. These fish were captured from 4 beach seine net hauls and 2 beam trawl samples (Figure 4.1) across a total of 118 nettings (42 beach seine, 44 beam trawling and 32 fyke nets). The highest number captured from a single haul were from nettings within the Middle Suir Estuary (n=4) and New Ross Port (n=4) sections. Three smelt were captured in the Barrow Nore Estuary section, two in the Nore Estuary and one in the Upper Barrow Estuary (Figure 4.2). No smelt were captured in the Barrow Suir Nore Estuary, the Lower Suir Estuary and the Upper Suir Estuary sections (Figure 4.1).

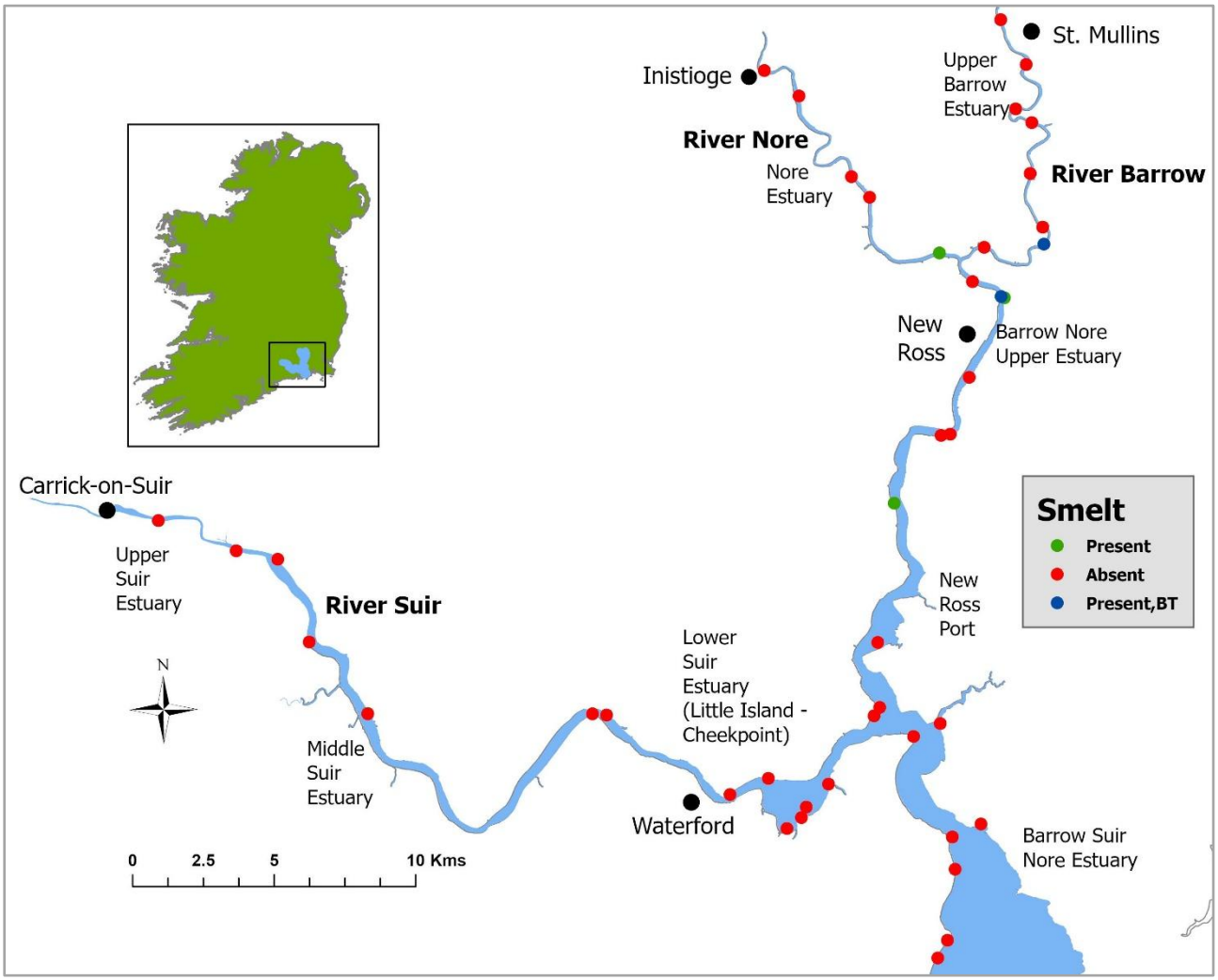


Figure 4.1. Seine net results for juvenile smelt as part of the WFD surveillance monitoring of the Barrow-Nore and Suir transitional waters October 2024; presence in two beam trawling (BT) are also shown.

The fish lengths ranged from 65 mm – 200 mm across all sites (Figure 4.2). The largest smelt was captured in the Barrow Nore Estuary Upper section (Figure 4.2) while the smallest smelt to be captured was caught in the New Ross Port. The average fish length was 9.3 mm.

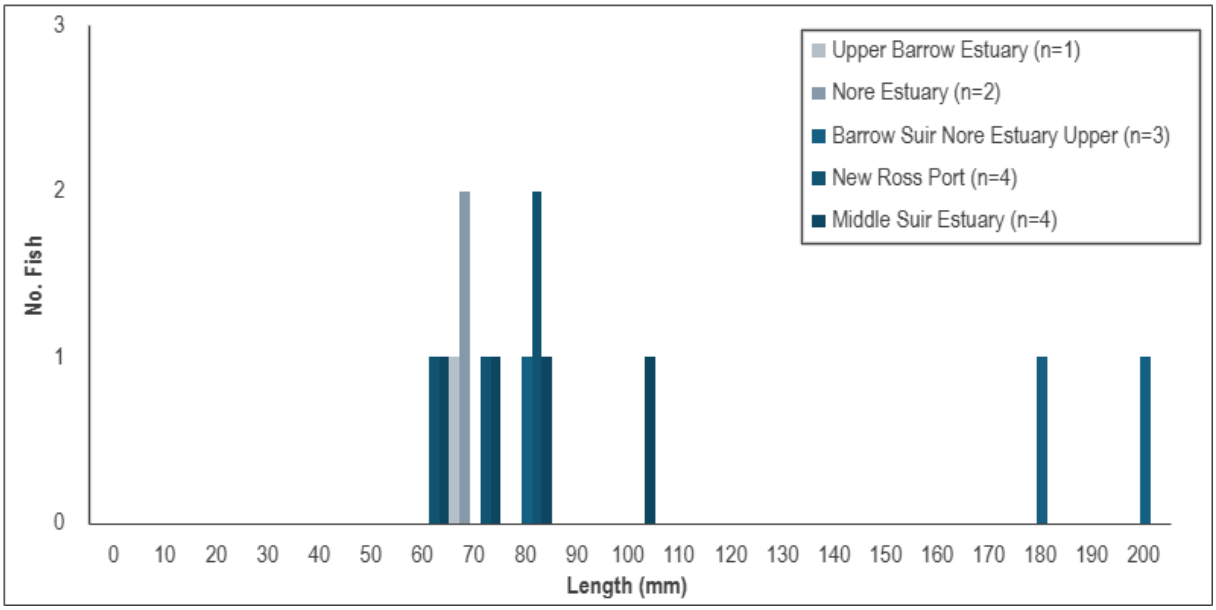


Figure 4.2. Length frequency of juvenile smelt from WFD surveillance monitoring of the Rivers Barrow-Nore and Suir transitional waters October 2024.

5. Conclusions and Plans for Future Work

The monitoring programmes for lamprey and shad continued in 2024, which represented the final year in the six-year Article 17 reporting cycle (2019 – 2024). Notable observations and findings for the current reporting period include:

- Unsettled weather with prolonged heavy rainfall and high water levels, particularly in March and April, impacted survey work in 2024. Shad egg surveys (April – June) and river lamprey redd counts (March – May) were particularly affected and the start date for these surveys was later than in previous years.
- As in 2023, river lamprey redd counts were very low in the current year, with a small number recorded in the Rivers Dee and Slaney. No redds were recorded in the Mulkear and Avoca, which are considered important rivers for this species. It is possible that high river flows impacted spawning again this year and/or made the detection of redds more challenging.
- Spawning activity of sea lamprey was much reduced or largely absent at several important locations such as Annacotty and Ennis. Other locations, such as St Mullins, had appreciable numbers of redds. It is hoped that numbers at the former location will return to more normal and expected levels in 2025 and that the poor results in 2024 are a once-off event.
- Larval lamprey electro-fishing surveys were carried out in 6 SAC and non-SAC channels in 2024. Two river lamprey transformers were recorded upstream of barriers on the River Feale and one was captured upstream of a barrier in the upper tidal limits of the River Leannan. These captures represent the first records for river lamprey on these rivers since the electro-fishing surveys began in 2007.

The HD team developed a Survey123 redd count app for lamprey and salmonids in 2023 and training was provided in 2024 to IFI staff in the NWRBD for use during their winter salmon spawning patrols. Training was also provided to staff working on the Moy catchment on the ecology of lamprey and on the status of lamprey species in this catchment. Members of the HD team had the opportunity to attend the Teagasc Farmland Biodiversity Day in August and used this platform to inform the general public about the conservation fish species we monitor.

The current 6-year monitoring cycle was completed in 2024 and the focus next year will be on the assessment and reporting on the conservation status of the Annex II/V fish species for Article 17.



Plate 3.6 The River Leannan upstream of Lough Fern, Kilmacrenan, Co. Donegal.

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