National Programme: Habitats Directive and Red Data Book Fish Species

Summary Report

2020

IFI/2021/1-4566

Iascach Intíre Éireann
Inland Fisheries Ireland

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Habitats Directive Report 2020

Executive Summary

Monitoring of the Habitats Directive Annex II/V fish species continued in 2020, which represented the second year in the 6-year Article 17 reporting cycle (2019 – 2024). It was an exceptional year with imposed public health measures that included restrictions on movement to inhibit the spread of the Covid-19 virus. Notwithstanding the challenges in 2020, the majority of surveys were able to proceed albeit with reduced capacity in some instances and with a focus on catchments that could be visited by day trips from HQ in Citywest. Adult river lamprey (*Lampetra fluviatilis*) nest count surveys (March/April) and sea lamprey (*Petromyzon marinus*) float-over surveys could not be carried out in 2020.

Larval lamprey surveys were carried out between the 13th August and 15th September in 2020. A total of 54 index sites within 9 catchments and 4 RBDs (Eastern, South-Eastern, Shannon and Western) were sampled. These included the Barrow, Nore, Suir, Mulkear and Garavogue-Bonet SACs and the Liffey, Tolka, Maigue and Graney non-SAC catchments. A total of n=919 *Lampetra* spp. were recorded from the 54 sites and no sea lamprey larvae were captured. Data from the monitoring of index sites will be used to assess short-term and long-term trends in the population of brook lamprey (*Lampetra planeri*) for Article 17 reporting.

The Slaney, Nore and Suir catchments were selected for river lamprey macrophthalmia (post-metamorphic juveniles) surveys over the winter months in 2020. Given the Covid-19 restrictions and high water levels in main channels and tributary rivers only a small number of sites could be surveyed on the Slaney and Nore. Sites were selected in the upper reaches of both catchments to investigate the range for this species and to assess the potential impact of migration barriers, particularly weirs. Ten sites were sampled on the Slaney and 7 macrophthalmia were recorded from 4 sites. These findings give a clear indication that, when conditions are favourable, adult river lamprey are able to surmount a number of substantial weirs to reach spawning grounds in the upper catchment. No river lamprey were recorded from the 9 sites surveyed on the Nore. Given the small number of sites, it is not conclusive that river lamprey have a restricted range on the Nore catchment and further investigations are required.

Sea lamprey spawning hotspot surveying was able to proceed relatively unaffected by Covid-19 restrictions from late May to early July 2020. Repeat visits across a network of traditional spawning locations on SAC rivers confirmed typical levels of redd-building on the River Fergus in Ennis, the River Shannon at Plassey, and the Mulkear River at Annacotty.

Less favourable results were recorded for other locations, for instance the River Nore at Thomastown.

Canoe-based float over surveys to quantify spawning effort along main channel SAC rivers were not possible during 2020, with walk-over surveys conducted instead as viable alternatives on the Suir and Munster Blackwater rivers during June and July. Little or no evidence of spawning activity was noted on any of these occasions.

As part of IFI's National Bass Conservation programme, seine netting surveys for juvenile bass (*Dicentrarchus labrax*) were carried out in August 2020 at 3 locations on the Munster Blackwater, Barrow and Slaney estuaries, all of which are designated SACs for twaite shad. As young-of-year shad are often captured as bycatch in these surveys, they give an indication of successful spawning events for this species in the respective rivers. Four shad, measuring 62 – 70mm total length were captured from Lickey Point on the lower Munster Blackwater estuary/Youghal Harbour. Another four shad (50 – 68mm) were captured at Fisherstown on the Barrow/Nore estuary while no shad were recorded from Mary's Point on the lower Slaney estuary.

Juvenile smelt (*Osmerus eperlanus*), a Red List species (King *et al*. 2011), were also recorded from the seine netting surveys of the Barrow and Munster Blackwater estuaries. Eight young-of-year smelt (42 – 84mm) were captured at Fisherstown while 30 smelt (64 – 163mm) were recorded at Lickey Point. No smelt were recorded from the seine nets at Mary's Point on the Slaney estuary.

The fish communities in 3 estuaries (Munster Blackwater, Barrow-Suir and Slaney) were surveyed *via* trawled transects during September 2020. 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. Six shad (82 – 260mm) were captured from trawls on the Barrow-Suir estuary while a single shad was captured from each of the Munster Blackwater and Slaney estuaries measuring 265mm and 260mm respectively.

Twenty-one smelt, ranging in total length from 90- 250mm were captured from the trawling survey on the Barrow-Suir estuary in 2020. Three smelt were captured from the Munster Blackwater trawls, with an average total length of 217mm. A single smelt was encountered on the Slaney estuary measuring 220mm.

1. Introduction

Inland Fisheries Ireland (IFI), on behalf of the Department of the Environment, Climate and Communications (DECC), is responsible for reporting on the fish species (Table 1.1) listed in Annex II/V of the EU Habitats Directive (Council Directive 92/43/EEC). In addition to fulfilling the reporting requirements of the Directive, the HD team also monitors 2 fish species of conservation interest listed in the 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

2020 represented the second year in the 6-year monitoring and reporting cycle (2019 – 2024) for Article 17 of the Directive. It was an exceptional year as the world experienced a global pandemic and restrictions on movement, along with other public health measures, were imposed by the Irish government in March 2020 to curtail transmission of the Covid-19 virus. A revised field work programme was developed, including the production of risk assessments and Standard Operating Procedures (SOPs), with a focus on catchments and sites that could be visited and surveyed on day trips from IFI's headquarters in Citywest Dublin. The restrictions precluded adult river lamprey (*Lampetra fluviatilis*) nest count surveys from occurring in March/April and sea lamprey (*Petromyzon marinus*) float-over surveys planned for the Suir and Munster Blackwater Rivers. Notwithstanding the challenging circumstances, the majority of monitoring programmes were able to proceed, including sea lamprey nest counts, larval/juvenile lamprey surveys and surveys for shad (*Alosa* spp.) eggs and juveniles.

2. Lamprey Monitoring Programme

2.1 Larval lamprey Investigations

A number of range and index sites will be sampled for larval lamprey over the current 6-year monitoring cycle (2019 – 2024) as part of Article 17 reporting for the Habitats Directive. These sites were selected from previous catchment-wide surveys carried out over the period 2009 – 2018. They will be used to assess the range and population size of brook lamprey (*Lampetra planari*) as well as the extent and quality of habitat for all 3 lamprey species. The index sites have been selected from 13 SAC and 10 non-SAC catchments within 7 River Basin Districts (RBDs) and data from these sites will be used to assess short-term and long-term trends in population size. In this regard, index sites within SAC rivers will be sampled 3 times, while non-SAC sites will be sampled twice within the 6-year cycle.

Larval lamprey surveys were carried out between the 13th August and 15th September in 2020. A total of 54 index sites within 9 catchments and 4 RBDs (Eastern, South-Eastern, Shannon and Western) were sampled (Figures 2.3 to 2.10). These included the Barrow, Nore, Suir, Mulkear and Garavogue-Bonet SACs and the Liffey, Tolka, Maigue and Graney non-SAC catchments. Of these, the Bonet, Feale, Maigue and a short section of the Mulkear (Mulkear Ballymackeogh), are OPW arterially drained channels. The surveys in 2020 represented the first visit for these index sites within the current 6-year cycle.

Water temperatures during the survey period ranged from 9.2ºC at a site on the Garavogue-Bonet to 18.4ºC on the Suir. A semi-quantitative sample was taken at each site by electro-fishing for 2 minutes in a defined area (1m^2) of suitable nursery habitat, generally comprising fine sediments. As young-of-year larvae can be difficult to capture using this method, a quantitative pushnet sample was also taken from adjacent suitable areas of deposition if available. 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.

Suitable nursery habitat was present at all sites and, with the exception of a single site on the Garavogue-Bonet (GAR13), larval lamprey were recorded from all sites in 2020. A total of n=919 *Lampetra* spp. were recorded from the 54 sites (Figures 2.3 to 2.10) and no sea lamprey (*Petromyzon marinus*) larvae were captured. Densities ranged from n=1 (at 3 sites on the Liffey, Nore and Suir) to n=120 larvae at a site on the Mulkear River (MUL13). Mean densities ranged from 4/m^2 on the Garavogue-Bonet to 40/m^2 on the Mulkear (Table 2.1).

Table 2.1. Density and population structure of larval lamprey from index sites on 9 channels in 2020.

River Basin District (RBD)	Channel	No. Sites	Max. Density (No./m^2)	Min. Density (No./m^2)	Mean Density (No./m^2)	Max. Length (mm)	Min. Length (mm)
Eastern	Liffey	6	74	1	24	154	27
Eastern	Tolka	1	10	-	-	96	24
South Eastern	Barrow	10	21	4	12	158	30
South Eastern	Nore	7	25	1	13	137	21
South Eastern	Suir	12	31	1	13	141	15
Shannon	Mulkear	6	120	10	40	125	13
Shannon	Maigue	6	17	3	10	132	30
Shannon	Graney	2	56	22	39	111	21
Western	Bonet	3	10	0	4	127	34

Previous catchment-wide surveys of the Boyne (2015), Bonet (2016), Suir (2016), Mulkear (2017), Barrow (2017) and Nore (2018) found that, with the exception of the Bonet, all catchments were at favourable condition based on targets for larval *Lampetra* spp. as outlined in the Common Standards Monitoring Guidance (JNCC 2015). Length-frequency data indicated a range of size classes across all catchments (Figures 2.1 & 2.2), with lengths ranging from 13mm (MUL13) to 158mm on the River Barrow (BAR100).

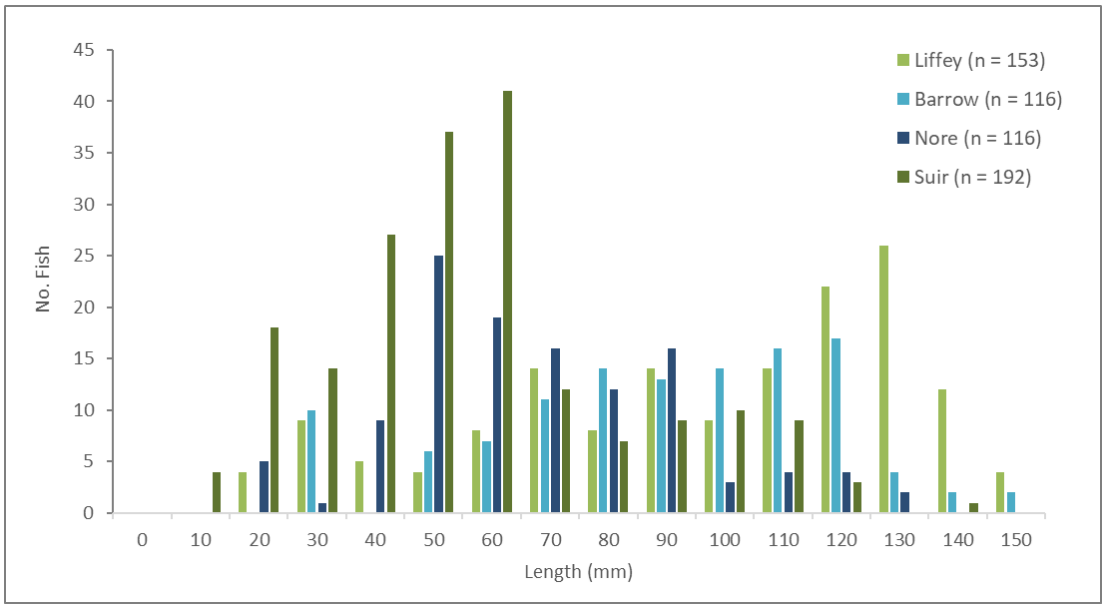


Figure 2.1. Pooled length frequency data for larval lamprey from index sites on the Liffey, Barrow, Nore and Suir in 2020.

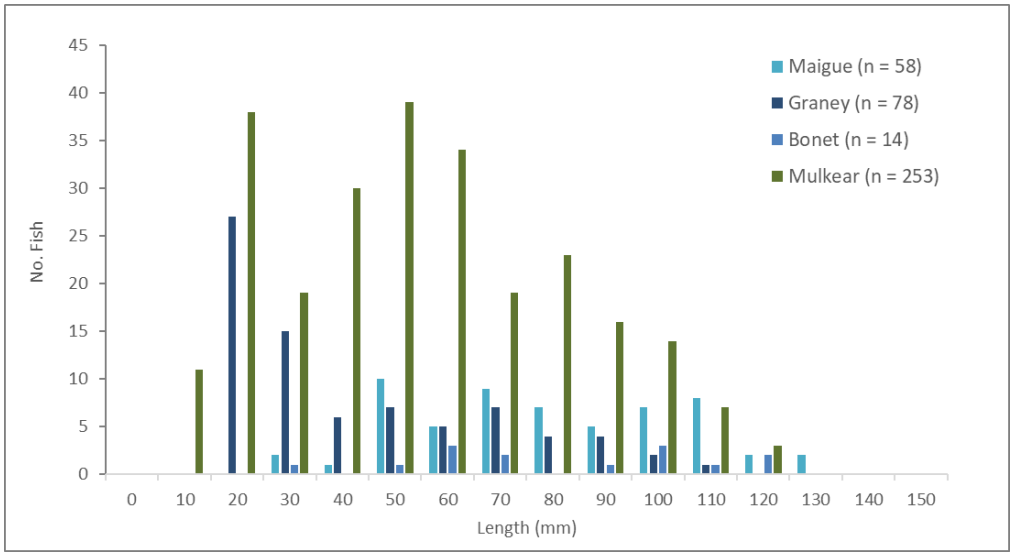


Figure 2.2. Pooled length frequency data for larval lamprey from index sites on the Maigue, Graney, Bonet and Mulkear in 2020.

Ten *L. planeri* macrophthalmia (post-metamorphic juveniles) were recorded from sites on the Liffey, Nore, Garavogue-Bonet and Mulkear and these ranged in length from 102mm (MUL13) to 137mm (Dinan1). Four transformers were recorded from 2 sites on the Barrow (BAR100 and BAR88) ranging in size from 124mm to 158mm.

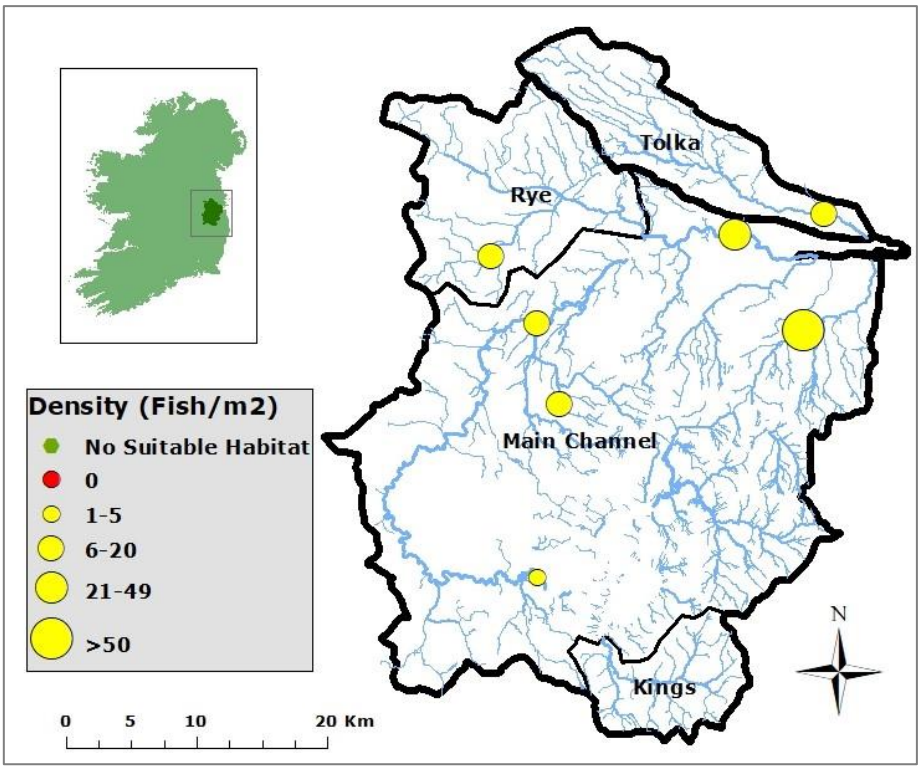


Figure 2.3. Larval *Lampetra* spp. densities at index sites on the Liffey Catchment in 2020.

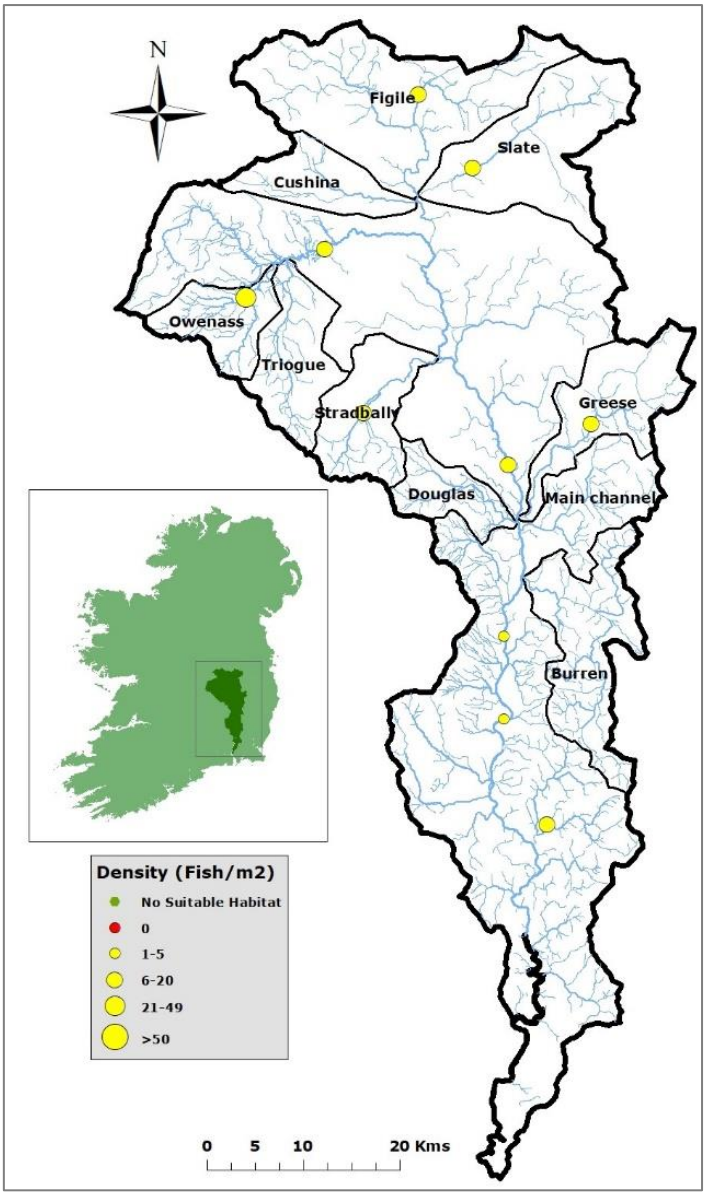


Figure 2.4. Larval *Lampetra* spp. densities at index sites on the Barrow Catchment in 2020.

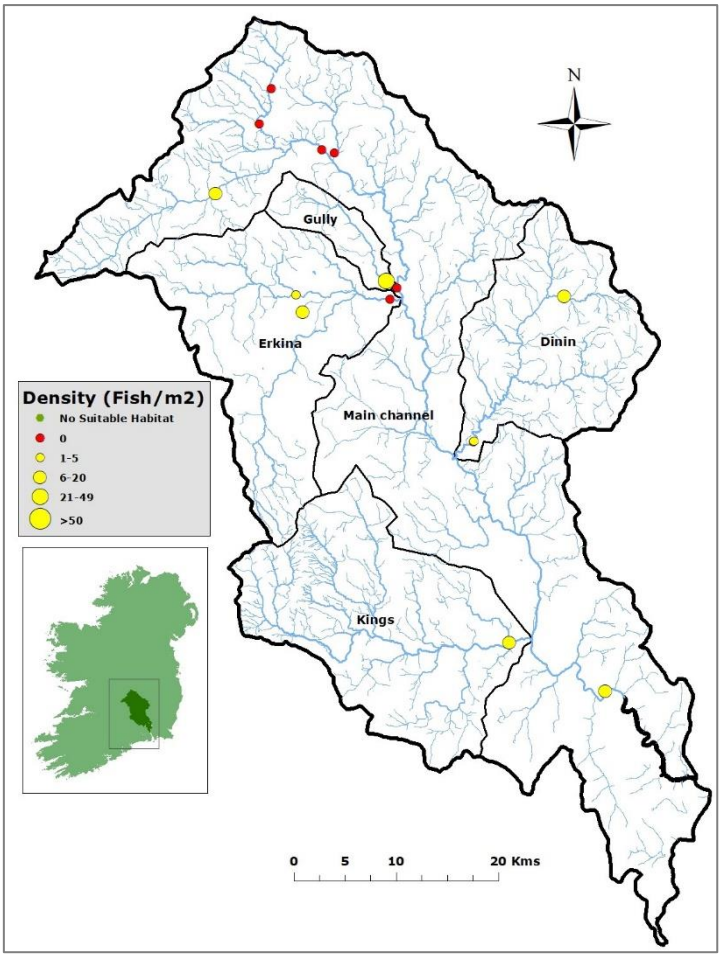


Figure 2.5. Larval *Lampetra* spp. densities at index sites on the Nore Catchment in 2020.

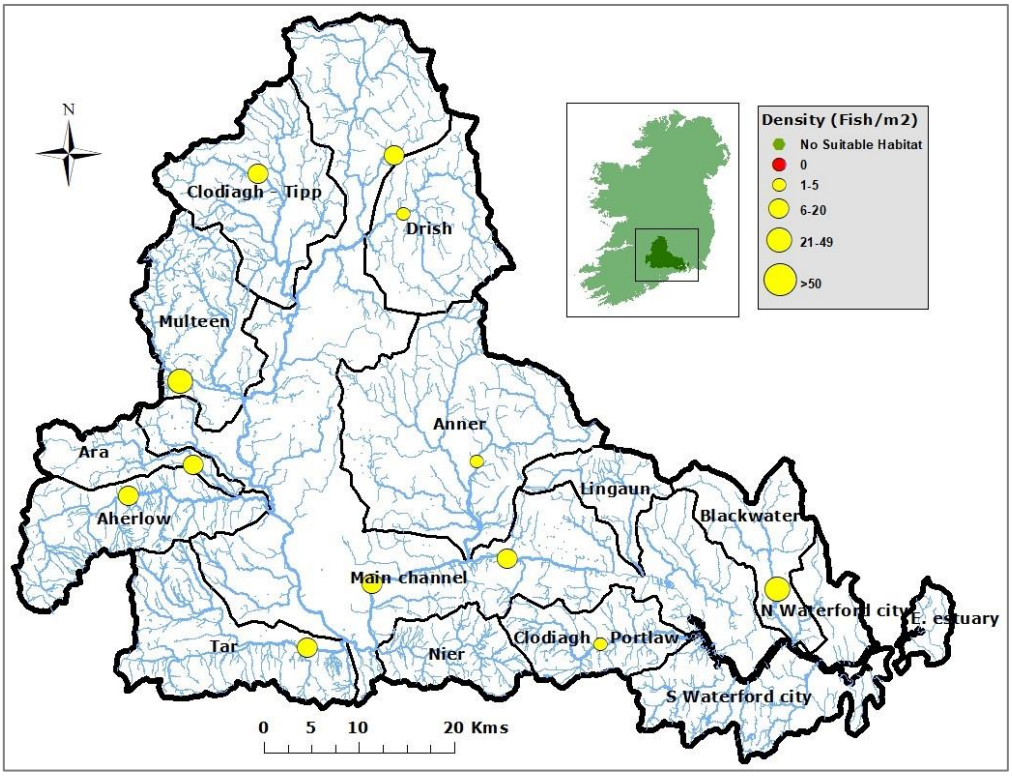


Figure 2.6. Larval *Lampetra* spp. densities at index sites on the Suir Catchment in 2020.

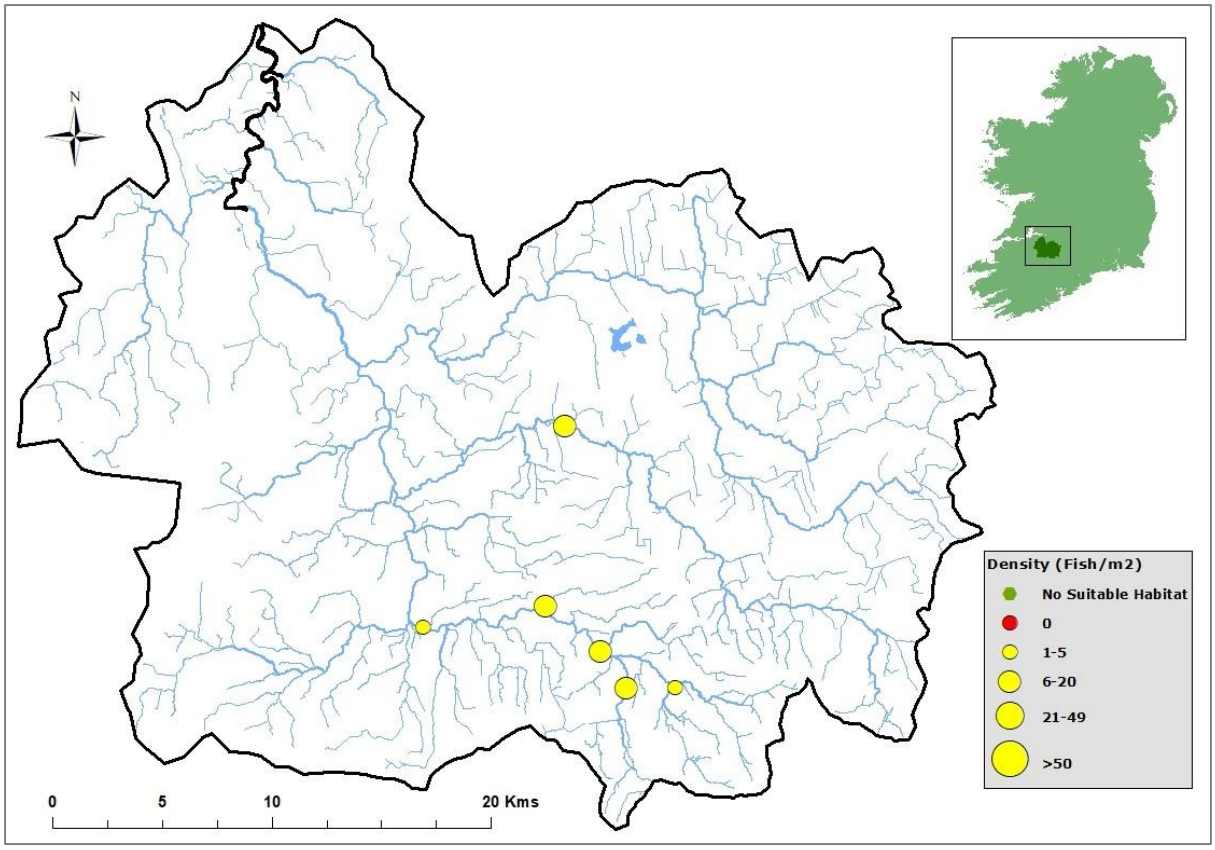


Figure 2.7. Larval *Lampetra* spp. densities at index sites on the Maigue Catchment in 2020.

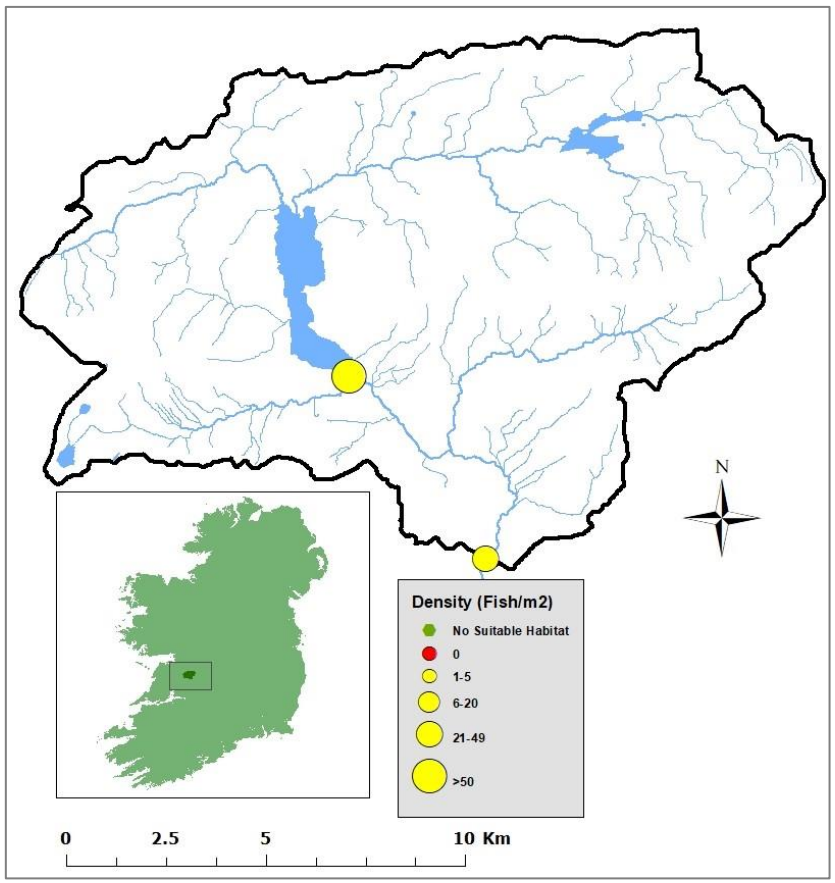


Figure 2.8. Larval *Lampetra* spp. densities at index sites on the River Graney in 2020.

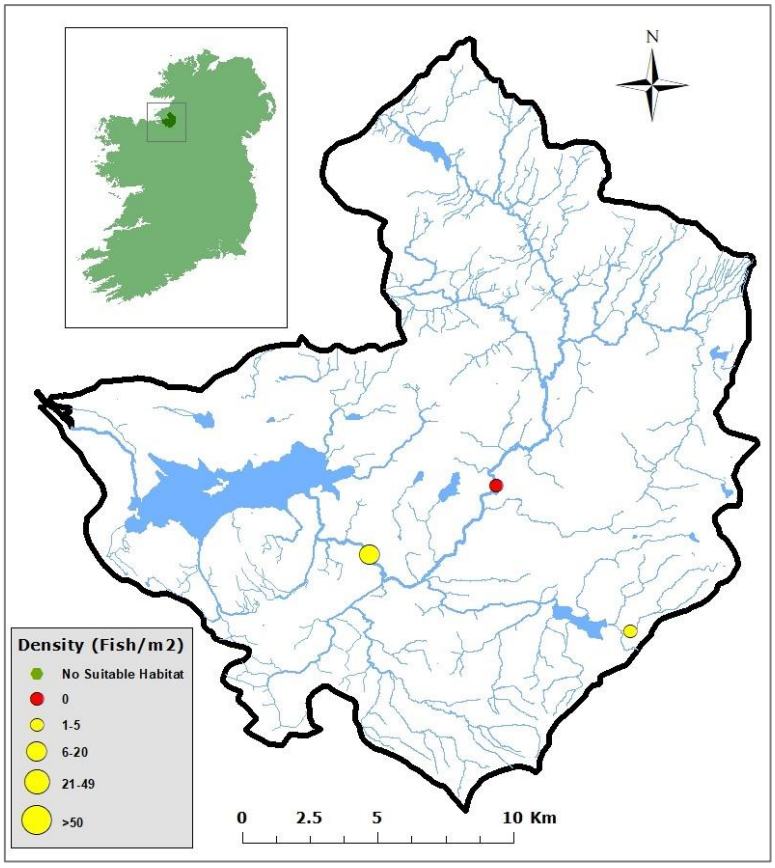


Figure 2.9. Larval *Lampetra* spp. densities at index sites on the Garavogue-Bonet Catchment in 2020.

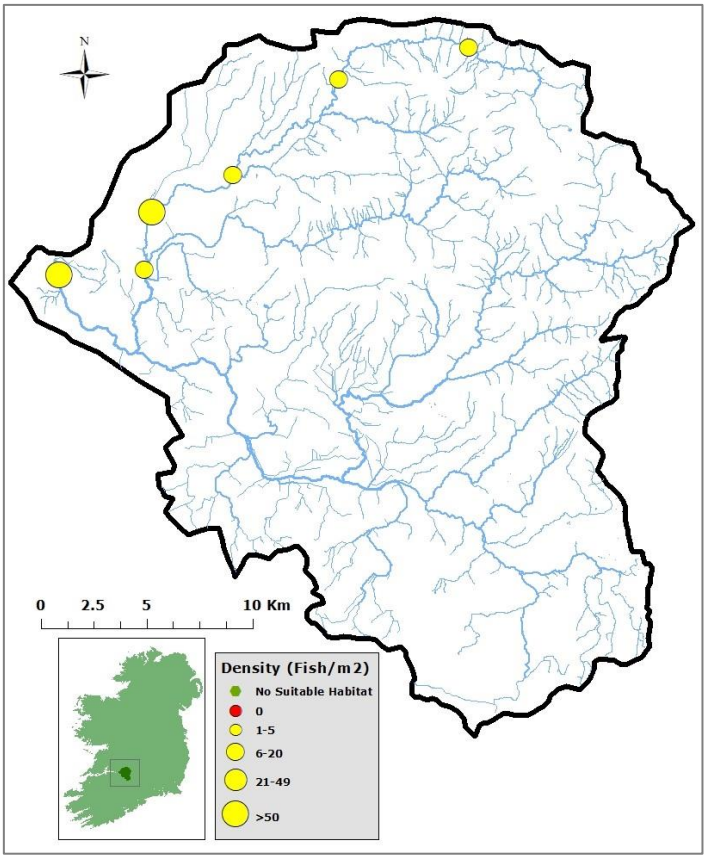


Figure 2.10. Larval *Lampetra* spp. densities at index sites on the Mulkear Catchment in 2020.

2.2 River lamprey Macrophthalmia (Rivers Slaney & Nore)

River lamprey (*Lampetra fluviatilis*) are protected under the Habitats Directive (92/43/EEC) and are listed in Annex II and V. Of the Habitats Directive species monitored by IFI, there is a paucity of data on river lamprey and their current conservation status is assessed as unknown (NPWS 2019). It is intended to address this data deficiency in the current reporting cycle (2019 – 2024) by conducting adult nest count surveys and targeted electro-fishing surveys for post-metamorphic juveniles (macrophthalmia). Adult river lamprey migrate upstream between October and February to spawn in March/April. During the upstream adult migration, juveniles are migrating downstream to estuaries. Challenges associated with monitoring river lamprey include the elusive nature of their spawning activity and inclement weather in Ireland over the winter months leading to high water levels for electro-fishing operations.

There are a small number of known spawning locations for river lamprey in SAC and non-SAC catchments and these are visited annually to monitor the number of adults and the number of nests constructed. As with the sea lamprey spawning hotspot surveys, it is hoped to investigate the occurrence of other important spawning locations for river lamprey and to survey these on an annual basis. Potential spawning sites will be pre-selected for survey and will be based on the local knowledge of IFI personnel and on spawning information recorded from targeted catchment-wide surveys (2009 – 2018) for larval lamprey.

Electro-fishing surveys for juvenile river lamprey are planned for SAC catchments to assess the distribution of river lamprey, particularly in relation to potential migration barriers and specifically large weirs. Differentiation between brook and river lamprey is not possible at the larval stage. Following metamorphosis, however, river lamprey macrophthalmia are more silver in colour with a larger eye and are easily differentiated from brook lamprey (Plate 2.1).

Electro-fishing surveys commence in October (by which time larval lamprey have undergone metamorphosis) and are conducted over the winter months prior to/or during downstream migration. In 2019 the Slaney catchment was surveyed and results for the macrophthalmia winter survey (2019/2020) are presented here. The Nore and Suir catchments were targeted in 2020 for both adult spawning and juvenile river lamprey. Due to the Covid-19 pandemic and the imposition of movement restrictions, it was not possible to carry out nest count surveys during the spawning period in 2020. Covid-19 restrictions and high rainfall over the winter months also curtailed the macropthalmia surveys and sampling for this life stage was possible only at a small number of sites in the upper Nore catchment.

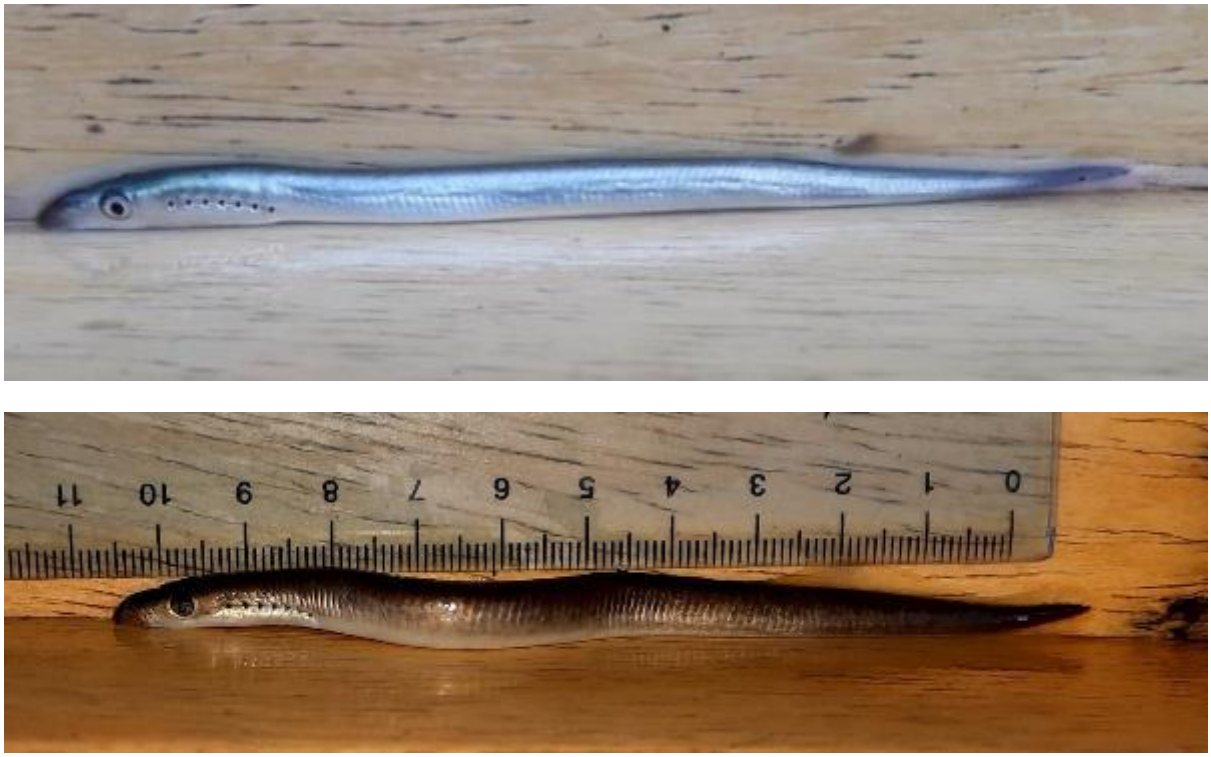


Plate 2.1. River lamprey (*Lampetra fluviatilis*) (top) and Brook lamprey (*L. planeri*) (bottom) macrophthalmia from the River Slaney and River Nore respectively.

A total of 34 sites were pre-selected on the River Slaney for a river lamprey macrophthalmia survey over the winter period 2019 – 2020. Due to rainfall patterns and subsequent high-water levels, it was not possible to survey all locations and a total of 10 sites were sampled in the upper Slaney catchment (Figure 2.11).

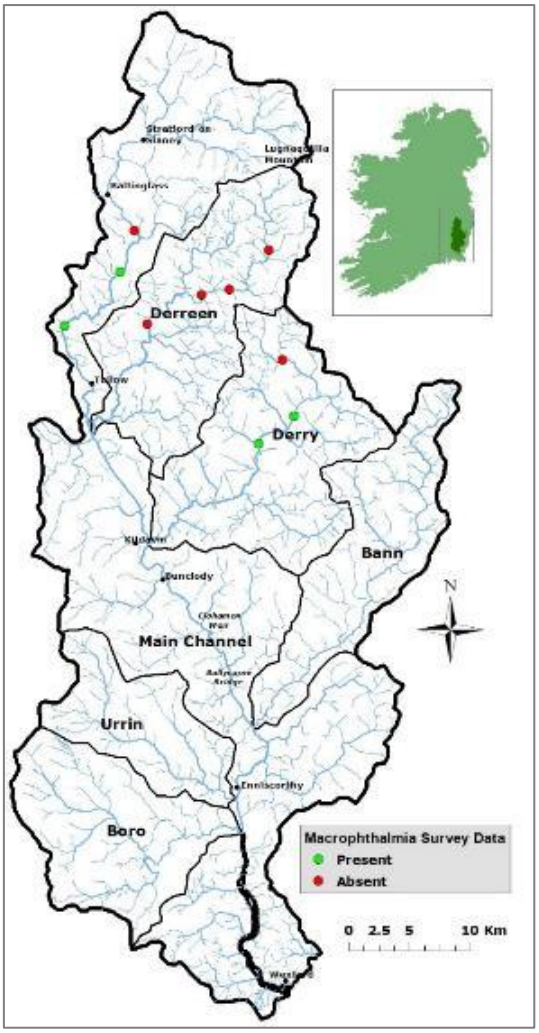


Figure 2.11. Distribution of macrophthalmia on the Slaney catchment, January 2020.

Backpack electro-fishing was carried out in a variety of habitats, depending on availability at individual sites, including fine silts, sandy substrates, submerged tree roots, organic detritus overlying coarse substrate, etc. A total of 7 macrophthalmia were recorded from 4 sites. There are a number of potential barriers between the estuary and the sites where river lamprey were recorded. SNIFFER surveys revealed that Ballycarney Bridge and Clohamon Weir, both downstream of Bunclody, are 'High Impact Partial Barriers' for adult lamprey. During extreme flood events, high water levels can facilitate the upward migration of adult river lamprey. The current survey gives a clear indication that adult river lamprey, when conditions are favourable, are able to ascend potential barriers on the River Slaney to reach spawning grounds in the upper catchment.

Nine sites were surveyed for river lamprey macrophthalmia on the Nore catchment during December 2020 (Figure 2.12).

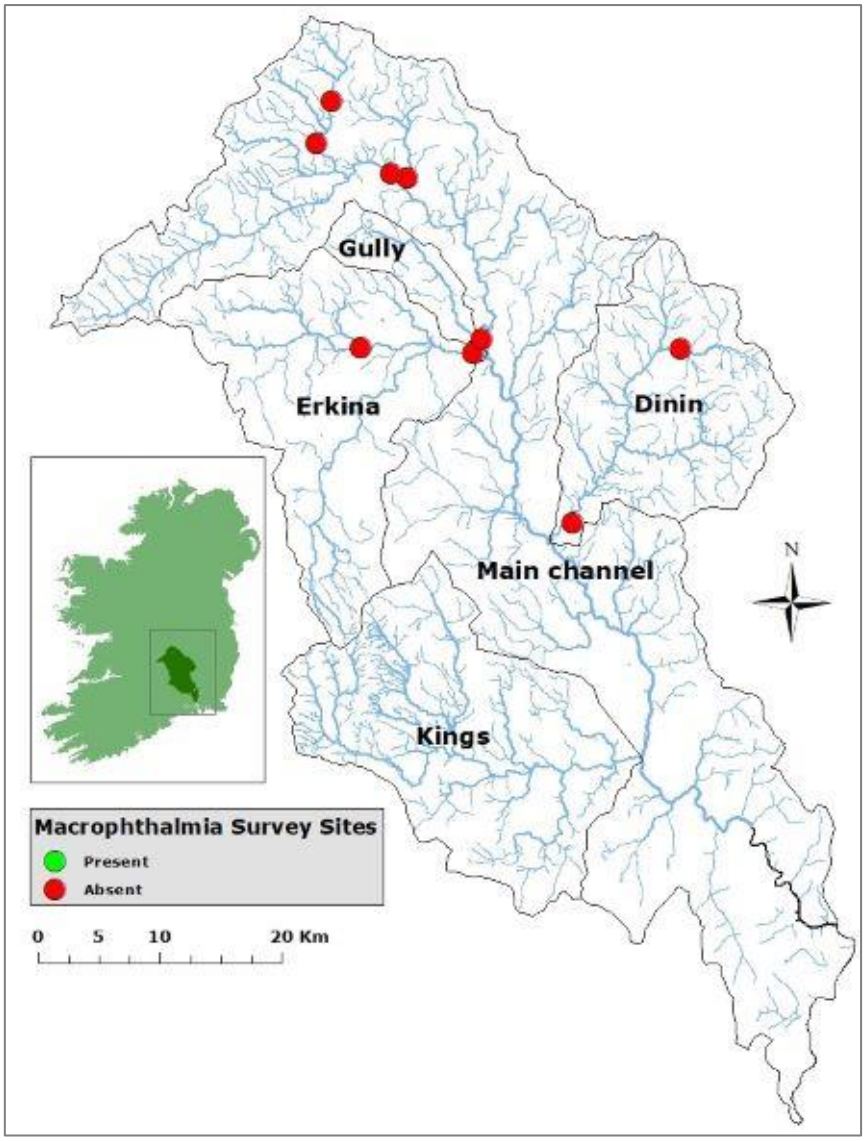


Figure 2.12. Distribution of macrophthalmia sites surveyed on the Nore catchment, December 2020.

As with the Slaney survey, it was decided to focus sampling in the upper reaches of the catchment, to assess the extent of distribution and to investigate whether river lamprey are able to ascend potential migration barriers lower down the catchment, notably weirs at Bennettsbridge and Kilkenny City. River lamprey macrophthalmia were not recorded at any of the 9 locations. Given the small number of sites, it is not conclusive that river lamprey have a restricted range on the Nore catchment and further investigations are required.

2.3 Adult lamprey investigations

2.3.1 Munster Blackwater & Suir walkover surveys

Given COVID-19 restrictions during 2020 it was impossible to undertake kayak & canoe-based floatover surveys. An acceptable alternative was to conduct walkover surveys along readily accessible sections of main stem river channels where suitable spawning habitats

had been noted during previous floatover surveys. The Munster Blackwater and Suir rivers were ideal candidates for walkover surveys and were visited during June and July 2020 by two-person teams complying with IFI COVID-19 SOPs for safe working.

Sections of the Munster Blackwater were visited on 2 separate occasions in June and July 2020, respectively. The first visit on June 16th covered locations between Mallow and Fermoy, specifically Mallow town (Castle section), Killavullen, Ballyhooly and Fermoy town, both upstream and downstream of the town bridge and breached weir. Water temperatures ranged between 15-16°C (Figure 2.13). No adult fish or redds were recorded at any of the river sections surveyed. The 2nd visit was undertaken on July 16th and focused on the stretch between Fermoy town and Lismore, specifically Carysville/Clondulane, Kilmurray, Ballyduff, Glenmore and Lismore town. On this occasion water temperatures averaged 18°C. Unfortunately, no redds were recorded during this particular walkover survey.

A slightly different approach was employed when surveying the River Suir. A total of 4 walkover surveys were undertaken during June (4th, 10th & 25th) and July (2nd) 2020, with each visit comprising visual inspections of suitable habitat at various locations between Cahir and Carrick-on-Suir, while also including hotspot surveys in the Clonmel town section. Redds had been previously noted during floatover surveys in sections of suitable habitat immediately downstream of Cahir town, at Swiss Cottage, Ardfinnan, Newcastle, Knocklofty and Kilsheelan. Surveying effort, therefore, was targeted towards these locations. Redds were observed in Clonmel town (Table 2.2), however no activity was noted at any other location, save for a dead sea lamprey in Carrick-on-Suir on the first visit (June 4th).

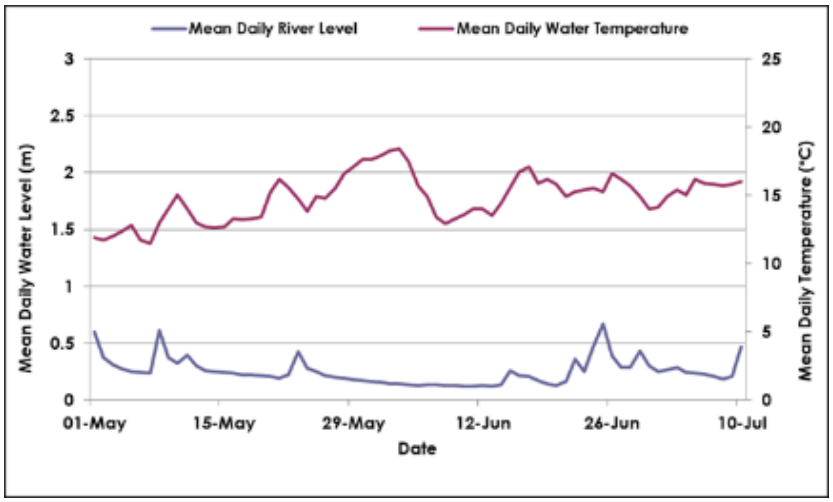


Figure 2.13. Munster Blackwater river levels and water temperatures measured at Ballyduff (OPW hydrometric gauging station #18002) during the 2020 sea lamprey migration and spawning period.

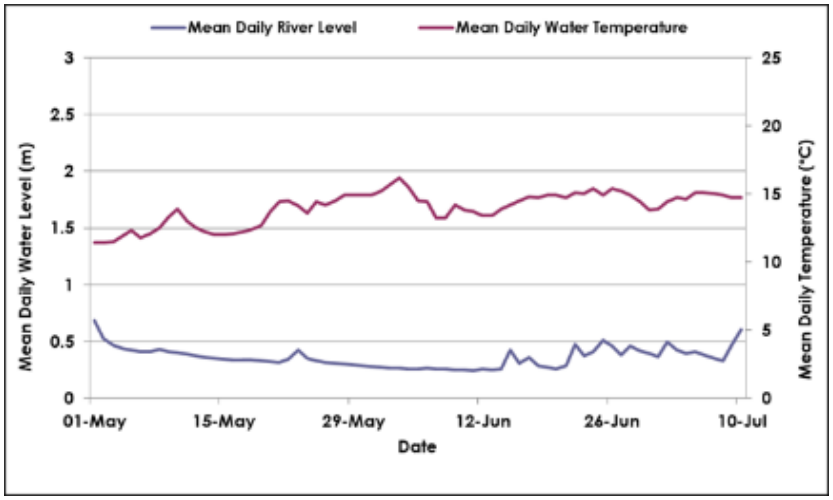


Figure 2.14. River Suir levels and water temperatures measured at Carrick-on-Suir (OPW hydrometric gauging station #16062) during the 2020 sea lamprey migration and spawning period.

Plate 2.2. The Munster Blackwater at Kilmurray.

Plate 2.3. The River Suir from the Old Waterford Road bridge.

2.3.2 Monitoring sea lamprey spawning Hotspots

Sea lamprey spawning hotspot surveying was one of the few Habitats Directive monitoring strands which proceeded in 2020 largely unaffected by COVID-19 restrictions. Repeat visits were undertaken from late May through to mid-July to noted spawning sites on individual SAC rivers across the south and southeast as well as within the Lower Shannon SAC (Figure 2.15), 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 2.2.

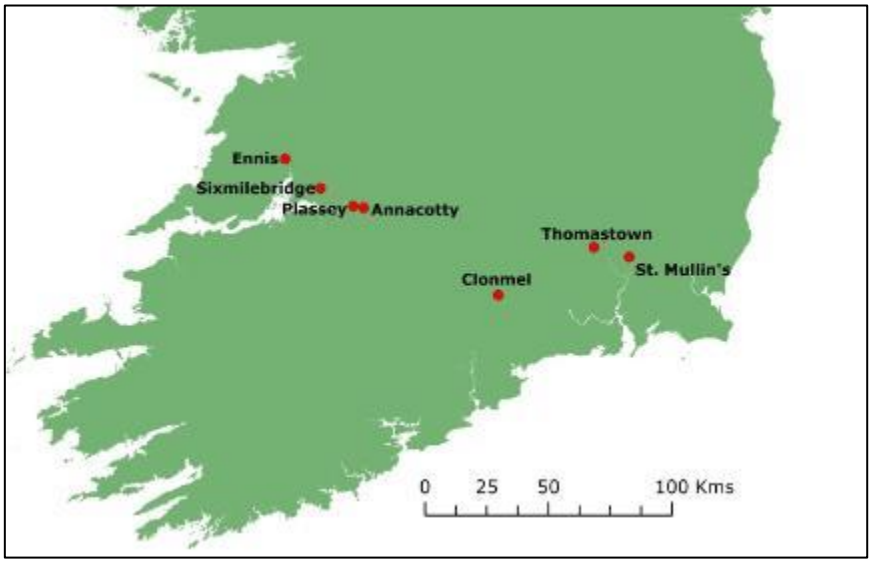


Figure 2.15. Location of principal sea lamprey spawning 'hotspots' surveyed annually.

The River Fergus in Ennis town is an important sea lamprey spawning location, specifically the 1km urban stretch from Mill Street Bridge downstream through Wood Quay and Harvey's Quay, through Bank Place and onwards past Club Bridge, along Newbridge Road to Steele's Rock and the rear of Cusack Park. Surveying in Ennis town is greatly augmented every year by the observations provided by a highly reputable locally based 'Citizen Scientist', providing IFI with accurate accounts of the commencement, progression, intensity, and cessation of spawning. During 2020 sea lamprey activity was noted from May 24th until June 24th. During a visit on June 9th a total of 12 adult fish and 33 individual nests were counted throughout the 1km river section (Table 2.2).

The Mulkear River at Annacotty, Co. Limerick was visited on 6 occasions from late May to mid-July 2020. The initial visit on May 27th established that spawning was underway (Table 2.2). By the following week (June 2nd) spawning activity had intensified with numerous and widespread nest excavation noted on this and subsequent visits. On one occasion (July 1st) water levels were too high and coloured following rainfall to allow surveying (Figure 2.16). By

mid -July (13th) no current or recently completed nests were evident, and by the following week (July 20th) all structures were well-aged and less visible due to algal growth.

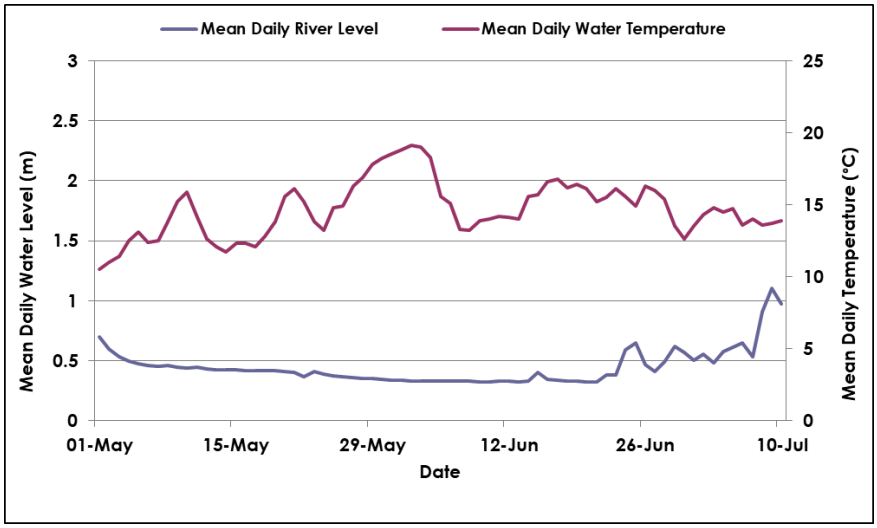


Figure 2.16. Mulkear River levels and water temperatures measured at Annacotty (OPW hydrometric gauging station #25001) during the 2020 sea lamprey migration and spawning period.

Plate 2.4. The annually surveyed hotspot section on the Mulkear River at Annacotty, Co. Limerick.

For the Mulkear catchment in general, several locations on upstream tributaries exist where spawning is noted almost annually for some and less frequently for others. A selection of these sites were revisited in 2020 to detect upstream migration and to appraise the efficacy of fish passage structures incorporated into Annacotty Weir. The only location where sea lamprey redds were noted was at Scart (n=1) immediately downstream of the confluence of the Mulkear and Killeenagarriff rivers. No redds were found during searches further

upstream at Killeenagarriff Bridge or at New Bridge on the Bilboa River. A previously noted spawning location on the latter river upstream of Cappamore had no redds in 2020, the 5th year in succession where none were recorded. The overall absence of nests at a variety of locations in the mid/upper catchment implies passage issues at Annacotty Weir preventing onward progression into the interior of the system.

Table 2.2. Sea lamprey activity (counts of adult fish and redds) recorded during repeat visits to recognised spawning 'hotspots' during 2020. Reports submitted by members of the public are indicated by asterisks (*). Instances where redds were too numerous and aggregated to discern and count accurately are documented as such.

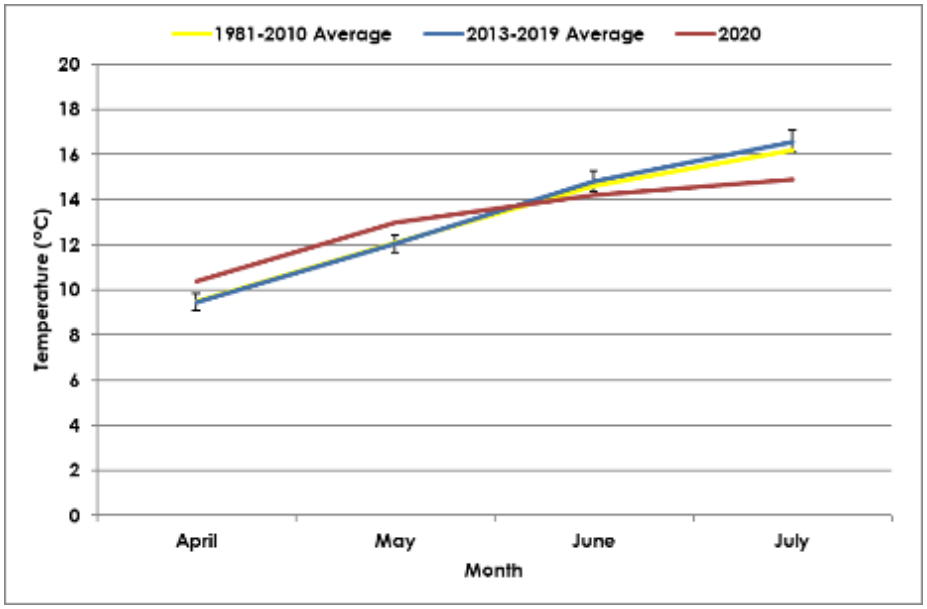
Date	Location	Sea lamprey	Redds	Temp (°C)
29/05/2020	River Fergus, Ennis Town, Co. Clare	Present *	Present *	NA
9/06/2020		12	33	16.1
24/06/2020		Present *	Present *	NA
27/05/2020	Mulkear River, Annacotty, Co. Limerick	10	10	17.5
02/06/2020		8	Numerous	20.4
15/06/2020		3	Numerous	17.4
13/07/2020		0	No new redds	NA
27/05/2020	River Shannon, UL Living Bridge, Plassey, Co. Limerick	5	2	18.1
15/06/2020		7	Numerous	18.0
1/07/2020		0	Numerous	15.9
9/06/2020	Owengarney River, Sixmilebridge Co. Clare	0	1	16.1
1/07/2020		0	1	17.7
10/06/2020	River Suir, Clonmel Co. Tipperary	0	3	15.6
2/07/2020		0	7	17.1
5/06/2020	River Nore, Thomastown, Co. Kilkenny	0	1	15.8
26/06/2020		0	1	19.5
1/07/2020		0	1	17.1
5/06/2020	River Nore, Inistioge, Co. Kilkenny	0	0	17.8
26/06/2020		0	0	19.7
1/07/2020		0	3	17.1
15/07/2020		0	6	18.3
3/06/2020	River Barrow, St. Mullins, Co. Carlow	12	16	18.9
1/07/2020		0	12	16.8

Plate 2.5. Sea lamprey nests on the River Shannon, Plassey, Co. Clare

Redd building was recorded at other hotspots such as the River Barrow below St. Mullins Weir, the River Nore at Thomastown and Inistioge, the River Suir at Clonmel, the Owengarney River in Sixmilebridge and the River Shannon in the grounds of UL at Plassey (Table 2.2). Overall observations for this latter assemblage of hotspots in 2020 were broadly similar to previous years in relation to timing and effort. The exception was the Owengarney River in Sixmilebridge, Co. Clare where a single redd was observed from a short stretch in the village where typically 6-8 redds would be noted. Also noteworthy was the River Nore at Inistioge where a late burst of activity was recorded.

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 were in line with expected averages for the entire period (Figure 2.17a), whilst rainfall amounts were much lower than expected for May followed by a wet June and July (Figure 2.17b).

(a)



(b)

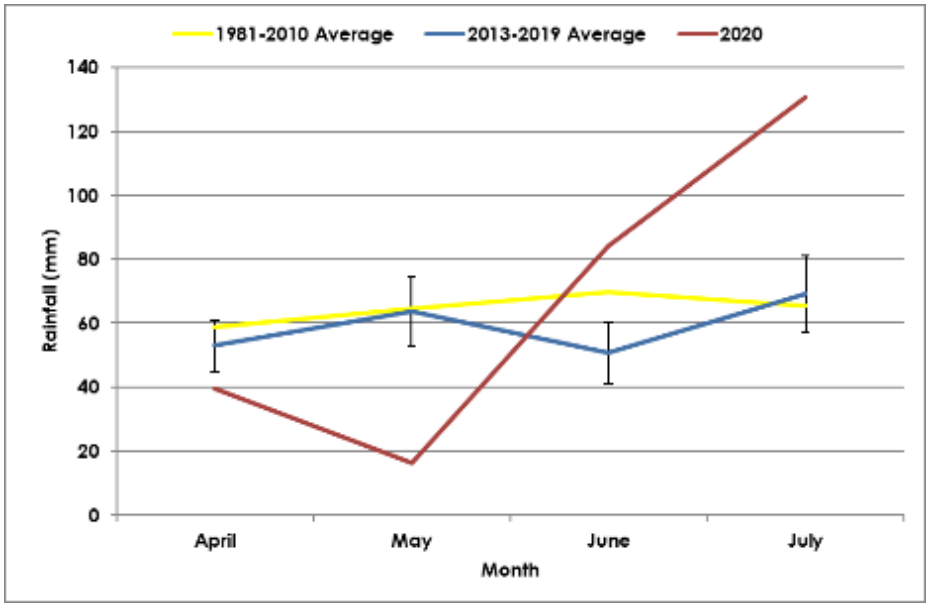


Figure 2.17. Monthly mean air temperatures (a) and total rainfall (b) from April 2020 to July 2020 recorded at Shannon Airport (Met Eireann) in comparison with both the 30 year (1981-2010) long-term average (LTA) and the preceding 6 year (2013-2019) average.

2.3.3 River lamprey Avoca Estuary

The Avoca estuary was surveyed as part of IFI's WFD monitoring of fish stocks in transitional waters. A multi-method approach is taken in these surveys, involving beach seine netting, fyke netting and beam trawling.

Fyke netting of the Avoca estuary was carried out between the 12th and 13th October 2020. Fyke nets (15m in length with a 0.8m diameter front hoop, joined by an 8m leader with a 10mm square mesh) are used to sample benthic fish in the littoral areas. All nets are processed on-site by identifying the species present, counting the total numbers caught and by taking a representative number of length measurements for each species. A single adult river lamprey, measuring 30cm, was captured in 1 of 4 fyke nets deployed in the estuary. The Avoca catchment is not an SAC for river lamprey but adult river lampreys have been captured previously (Gallagher *et al*., 2017) and spawning locations for this species have been identified on the Rivers Aughrim and Avonbeg.

3. Shad Programme

3.1 Juvenile shad Investigations

3.1.1 Shad Egg Surveys

Twaite shad (*Alosa fallax*) spawning runs are known to occur on the Barrow-Nore, Suir and Munster Blackwater, all of which are SACs for this species. The Common Standards Monitoring (CSM) guidelines for freshwater fauna (JNCC, 2015) advocates kick sampling for shad eggs as a way of determining the spatial extent of twaite shad spawning activity. Shad egg surveys commenced in 2017 and have been carried out at single locations on each of these 4 SAC rivers. Eggs have been recorded from all sites and, to date, genetic analysis of samples from St. Mullins (River Barrow) and Inistioge (River Nore) have confirmed them to be shad eggs. The Barrow and Nore were again targeted for sampling in 2020 and a single survey was carried out at St. Mullins and Inistioge in early June.

Increasing water temperature is an important environmental cue for spawning behaviour and eggs develop successfully in the range of 15°C to 25°C. Twaite shad spawn from mid-May to mid-July and, in Ireland, they appear to show a preference for the upper tidal reaches of estuaries. Spawning occurs at night over gravel beds in flowing, well-oxygenated, water with a depth of 1 – 2m. The eggs are clear, non-adhesive, semi-buoyant and range in diameter from 1.5 – 5mm (usually 2.4mm). They are broadcast into the water column where the majority sink to the river bed and remain in crevices until they hatch 4 – 8 days later.

Samples were collected by kick-sampling for 15 seconds upstream of a hand-held macroinvertebrate net (250µm mesh). 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.

Sampling of the River Barrow was carried out on the low ebb tide, downstream of the weir at St. Mullins, Co. Carlow on 3rd June when the water temperature was 18.9°C. The substrate consisted of a mixture of cobbles, gravels and coarse sand. Filamentous algal mats were a feature of the area at the time although the immediate study area was relatively clean. A total of 45 eggs were collected from 10 kick samples.

The Nore was sampled on 5th June, at a site located downstream of the bridge at Inistioge, Co. Kilkenny. The water temperature at the time of sampling was 17.8°C. Ten kick samples were taken but no eggs were recorded.

Abiotic factors such as water temperature and flow conditions are important in determining the success of spawning in a given year. High rainfall and flood events at the time of spawning have the potential to flush eggs or newly hatched larvae downstream and negatively impact recruitment. Water temperatures were recorded from OPW stations located at the upper tidal limits of the Barrow and Suir and from a riverine location on the Munster Blackwater (Figures 3.1 to 3.3). Maximum daily temperatures for these rivers during the period April to July were 22ºC, 16.9ºC and 18.5ºC respectively. Based on data for the Barrow and Suir, rising water temperatures coincided with favourable flow conditions on these rivers during the shad spawning period (Figures 3.1 and 3.2). Flow conditions during the month of May fluctuated more on the Munster Blackwater compared with the other two rivers but spawning was shown to have occurred on the Munster Blackwater in 2020 (see Section 3.1.3).

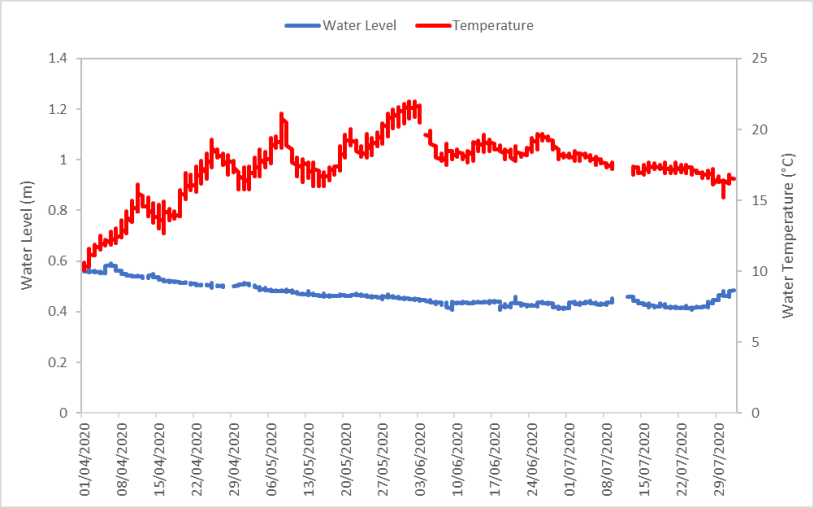


Figure 3.1. Daily water temperature (St. Mullins) and water level data (Graiguenamanagh) from OPW stations on the River Barrow during the twaite shad spawning period April - July 2020.

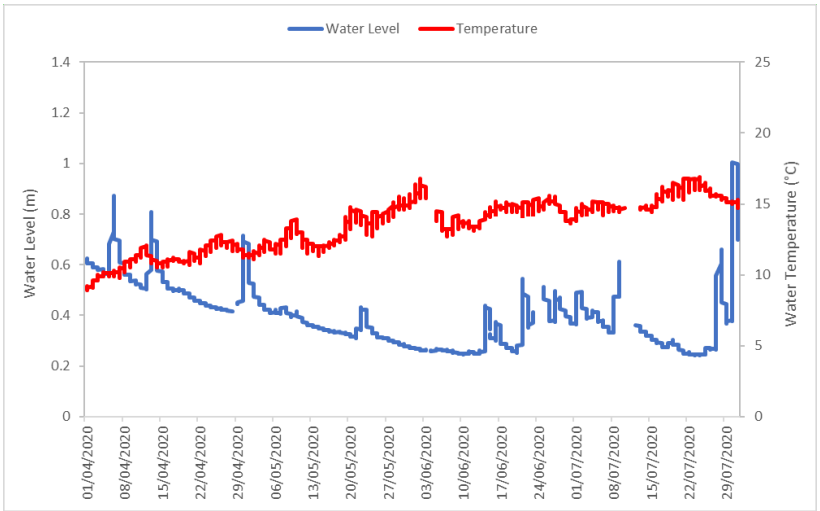


Figure 3.2. Daily water temperature (Carrick-on-Suir) and water level data (Carlow) from OPW stations on the River Suir during the twaite shad spawning period April - July 2020.

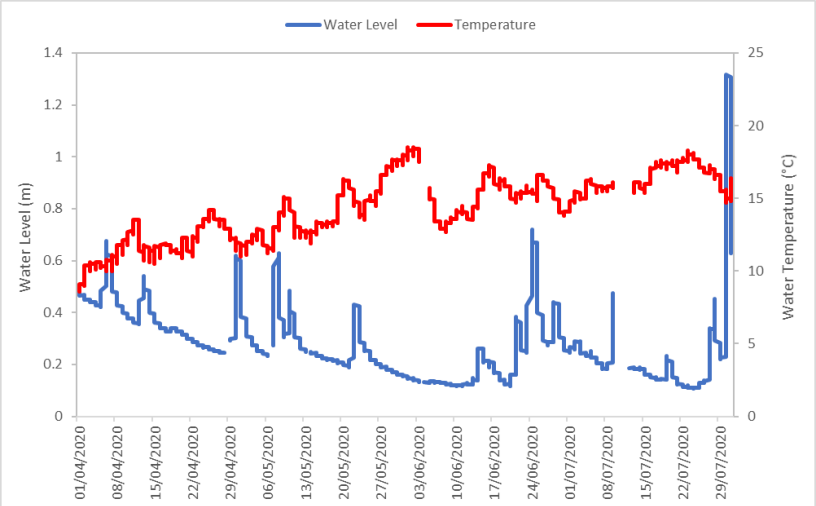


Figure 3.3 Daily water temperature (Glandalane) and water level data (Ballyduff) from OPW stations on the Munster Blackwater River during the twaite shad spawning period April - July 2020.

3.1.2 Beach seine netting surveys August 2020

As part of IFI's National Bass Conservation programme, seine netting surveys for juvenile bass (*Dicentrarchus labrax*) were carried out at 3 locations on the Munster Blackwater, Barrow and Slaney estuaries (Figures 3.4 & Table 3.1), all of which are designated SACs for twaite shad. As young-of-year shad are often captured as bycatch in these surveys, they give an indication of successful spawning events for this species in a given year.

Table 3.1. Seine netting locations as part of the Bass Conservation Programme in August 2020.

Estuary	Date	Location	No. Hauls	Mean Salinity (ppt)	Mean Temp (°C)	No. Shad
Munster Blackwater	26/08/2020	Lickey Point	5	0.82	15.44	4
Barrow	27/08/2020	Fisherstown	7	2.17	18.2	4
Slaney	28/08/2020	Mary's Point	5	4.2	17.26	0

The surveys were conducted between the 26th and 28th of August, 2020. It is important to note that surveying took place immediately after Storm Francis affected Ireland on the 24th-25th of August 2020. This storm caused significant flooding nationwide with rainfall totals of 45.5mm recorded in Roches point, Cork and 53.1mm at Valentia island observatory, Co Kerry on August 25th (Met Eireann, 2020). This may have resulted in an excessive amount of fresh water entering the watercourses prior to the commencement of surveying.

A Collins seine net was used to carry out the survey. This net measured 30.8m x 2m with a 14mm mesh size and a 5m central panel with a 6.5mm mesh. This net was deployed by boat in an arc shape and slowly drawn to shore. Due to Covid-19, restrictive measures were implemented during the 2020 netting survey. Social distancing was carried out by all staff members who participated, and the appropriate sanitisation protocols were followed to ensure a safe working environment. Overnighting by staff was not undertaken, meaning that day trips were required in order to complete the work programme. Overall, this resulted in a reduction in the number of hauls that could be completed when compared to previous years.

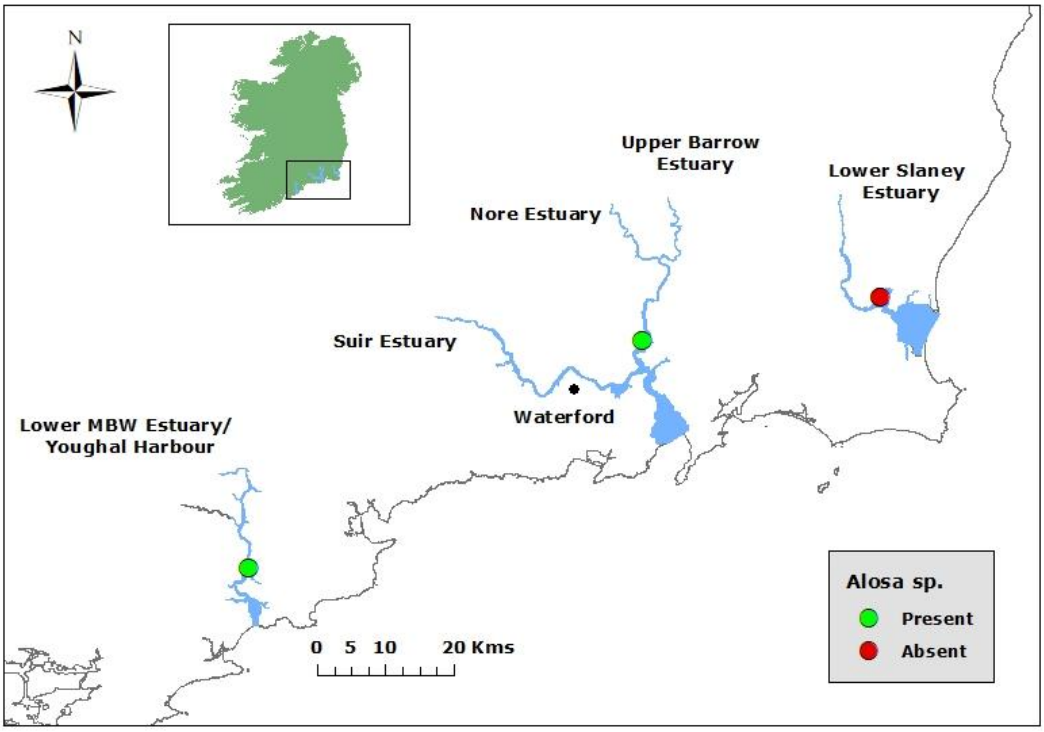


Figure 3.4. Locations of beach seining surveys of estuaries in 2020 as part of IFI's National Bass Conservation Programme, with presence/absence of juvenile *Alosa sp*.

3.1.3 Beach Seine netting survey of the Lower Munster Blackwater Estuary/Youghal Harbour

Beach seine netting on the Lower Munster Blackwater estuary/Youghal Harbour occurred in 1 location (Lickey Point) on the 26th of August 2020 (Figure 3.4). Five seine net hauls were taken from the muddy littoral of Lickey Point. The survey was undertaken in rising tide conditions with a mean salinity 0.82ppt across the 5 hauls and a mean water temperature of 15.4°C. Four shad measuring 70, 65, 64 and 62mm (total length) were captured at Lickey Point (referred to as Ballynaclash in previous years). Seven species of fish were recorded at this site in 2020. In 2019, fifteen shad were captured on the Munster Blackwater at

Ballynaclash (n=12) and Coolbagh (n=3) respectively. In 2018 three shad were recorded in total at Coolbagh (n=3).

3.1.4 Beach Seine netting survey of the Barrow/Nore estuary (New Ross Port Waterbody)

Beach seine netting on the Barrow/Nore estuary was carried out at 1 location (Fisherstown) on the 27th of August 2020. This site is sampled annually by the Bass programme. A total of 7 hauls were undertaken at this location with 9 species of fish recorded. Mean salinity in 2020 was 2.17ppt compared to an average of 8.1ppt in 2019. The mean water temperature recorded was 18.2°C. Four shad in total were captured measuring 64, 68, 58 and 50mm, respectively (Figure 3.5). These shad may have originated from spawning grounds located at the upper tidal limits of the River Barrow at St. Mullins and/or the River Nore at Inistioge. In previous years, *Alosa* sp. were also recorded at this site: in 2019 (n=14), 2018 (n=32), 2016 (n=69) and in 2014 (n=7).

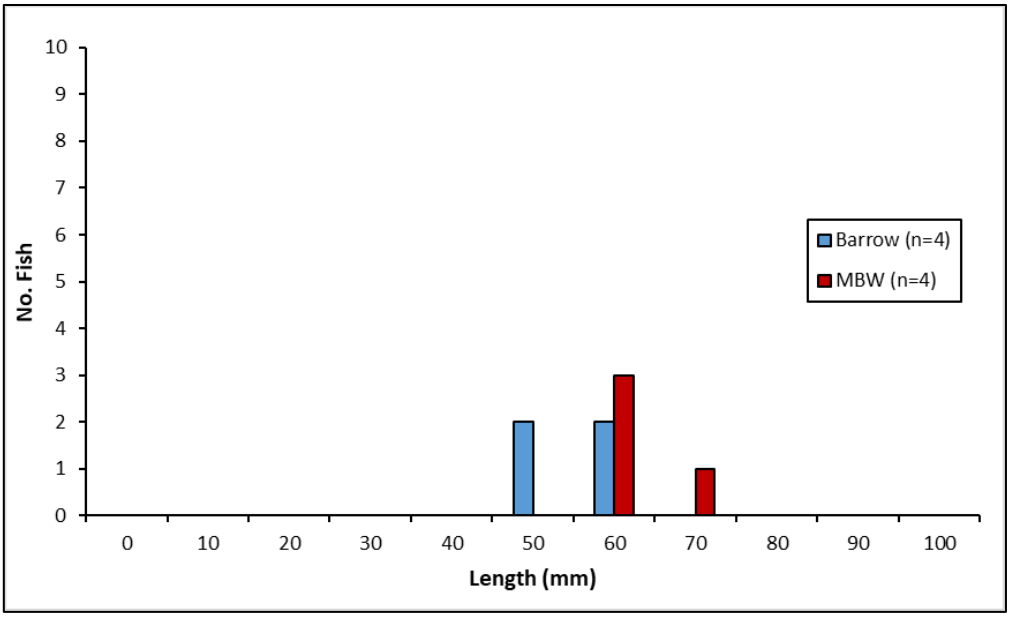


Figure 3.5. Length frequency of juvenile *Alosa* sp from the River Barrow and Munster Blackwater in the IFI Bass survey programme, August 2020.

3.1.5 Beach seine netting survey of the Lower Slaney Estuary

One location was sampled in the Lower Slaney Estuary in 2020 (Mary's Point). This was surveyed on the 27th of August with 5 seine net hauls undertaken. Mean salinity was recorded at 4.2ppt with a mean water temperature of 17.3C. In total 9 species of fish were captured during the survey. As in previous years however no shad were captured in the Lower Slaney Estuary in 2020.

3.2 Trawling Surveys

The fish communities in 3 Irish estuaries were surveyed *via* trawled transects during September 2020. 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 twaite shad, smelt and lampreys, are also occasionally encountered. Repeat surveys for 2020 were undertaken on the Munster Blackwater Estuary, the Barrow-Suir Estuary and the Slaney Estuary from the 18th- 25th September. Towed transect trawling was undertaken by a commercial trawler and crew with 2 IFI staff also on board to process catches and record data. Due to Covid-19, restrictive measures were implemented during the 2020 trawling survey. Social distancing was carried out by all staff members who participated, and the appropriate sanitisation protocols were followed to ensure a safe working environment.

3.2.1 Munster Blackwater Trawling Survey

Trawling surveys on the Munster Blackwater took place over two days (September 21st & 22nd). A total of 15 trawls were undertaken (Figure 3.6) overall with each lasting between 4 and 20 minutes (average 10 minutes). Trawling on the 21st was undertaken on an ebb tide while the 22nd occurred on a flooding tide. The trawl locations stretched from the mouth of the estuary at Youghal to Woods Point Area (d/s of Ballinaclash). Mean water temperature recorded across the 15 trawls was 16.1°C (range 15.5–17.1°C). Depth of the water column recorded across each trawl varied from 3m to 8m. Mean salinity was recorded as 20.9ppt (range 1.7 - 33.2ppt). In total, one twaite shad was captured measuring 265mm. This individual was recorded on trawl 9, the furthest upstream trawl.

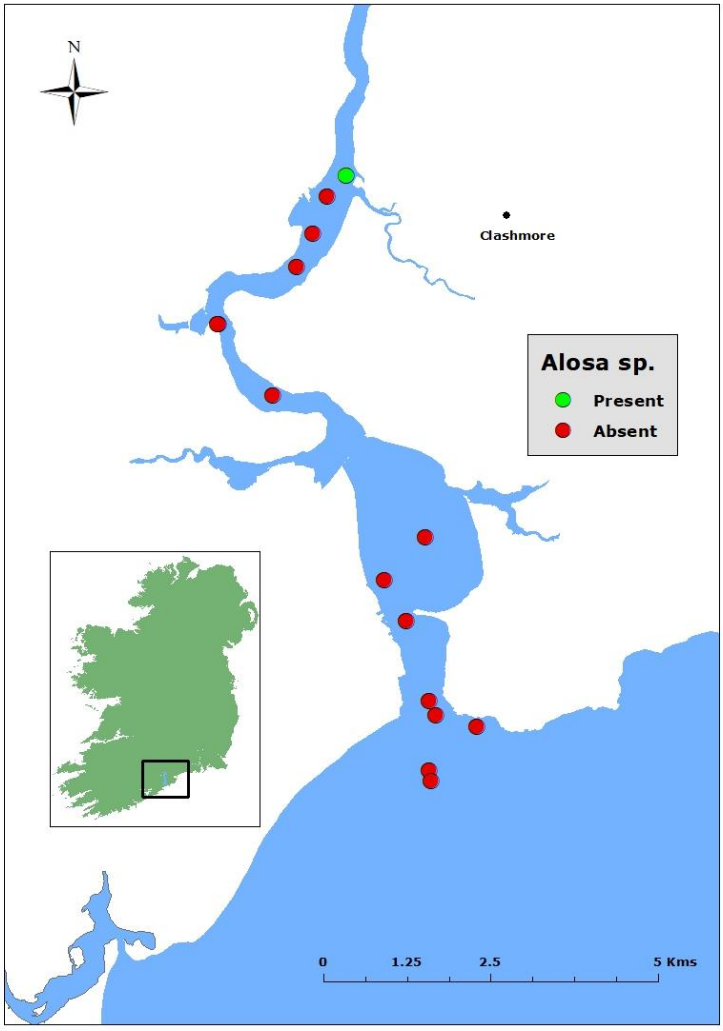


Figure 3.6. Incidence of capture of shad during the trawling survey transects (n=15) on the lower Munster Blackwater Estuary in September 2020.

3.2.2 Barrow-Suir Estuary Trawling Survey

Trawling surveys on the Barrow-Suir Estuary/ Waterford Estuary took place over two days (September 18th & 23rd). A total of 18 trawls were undertaken (Figure 3.7), the duration of each ranged from 2- 15 minutes (average 9 minutes). The trawl locations in the lower Barrow and Suir Estuary included Fisherstown, Kings Island, Cheekpoint, Passage strand and Woodstown. Water temperatures ranged from 15.7- 19.8°C across all 18 trawls with an average of 16.7°C, higher temperatures were recorded in the area close to the cooling water outflow from the power station at Great Island. Depth of the water column sampled varied from 3 – 18m (average 14.9m), with trawling occurring across a mix of ebb and flooding tides. A total of six twaite shad measuring 82- 260mm were captured at Fisherstown 'trawls 6 & 15' (n=3), and Old Trawler 'trawls 10 & 14' (n=3).

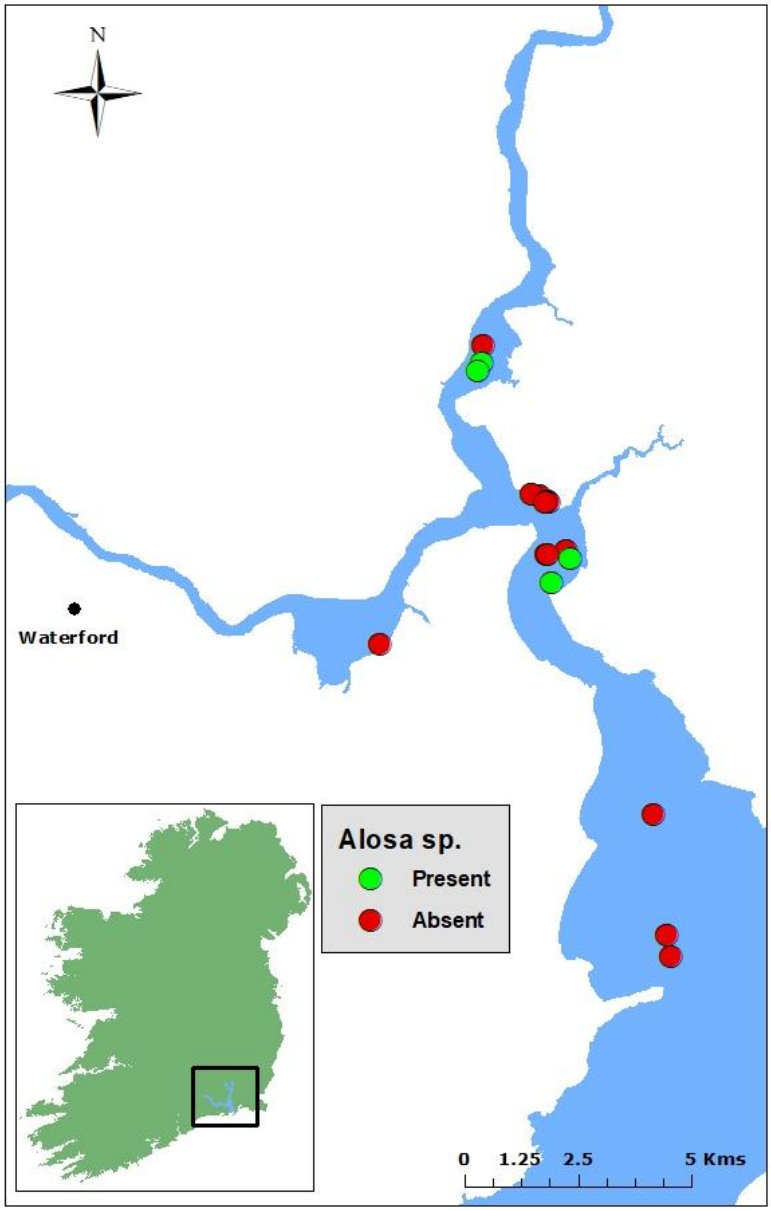


Figure 3.7. Incidence of capture of shad during the trawling survey transects (n=18) on the Barrow-Suir/ Waterford Estuary in September 2020.

3.2.3 Lower Slaney Estuary Trawling Survey

Trawling surveys on the Lower Slaney Estuary were undertaken on the 24th and 25th of September 2020. A total of 13 trawls took place over both days (Figure 3.8), the duration of each trawl ranged from 6 – 16 minutes (average 9 minutes 40secs). Water temperatures ranged from 13.8- 15.1°C across all 13 trawls with an average of 14.6°C. Depth of the water column across sampling sites varied from 3 – 9m (average 4.5m) while trawling occurred across flooding, top and ebb tides. One shad was captured (measuring 260mm) across the entire survey at trawl 9 'Above bridge'.

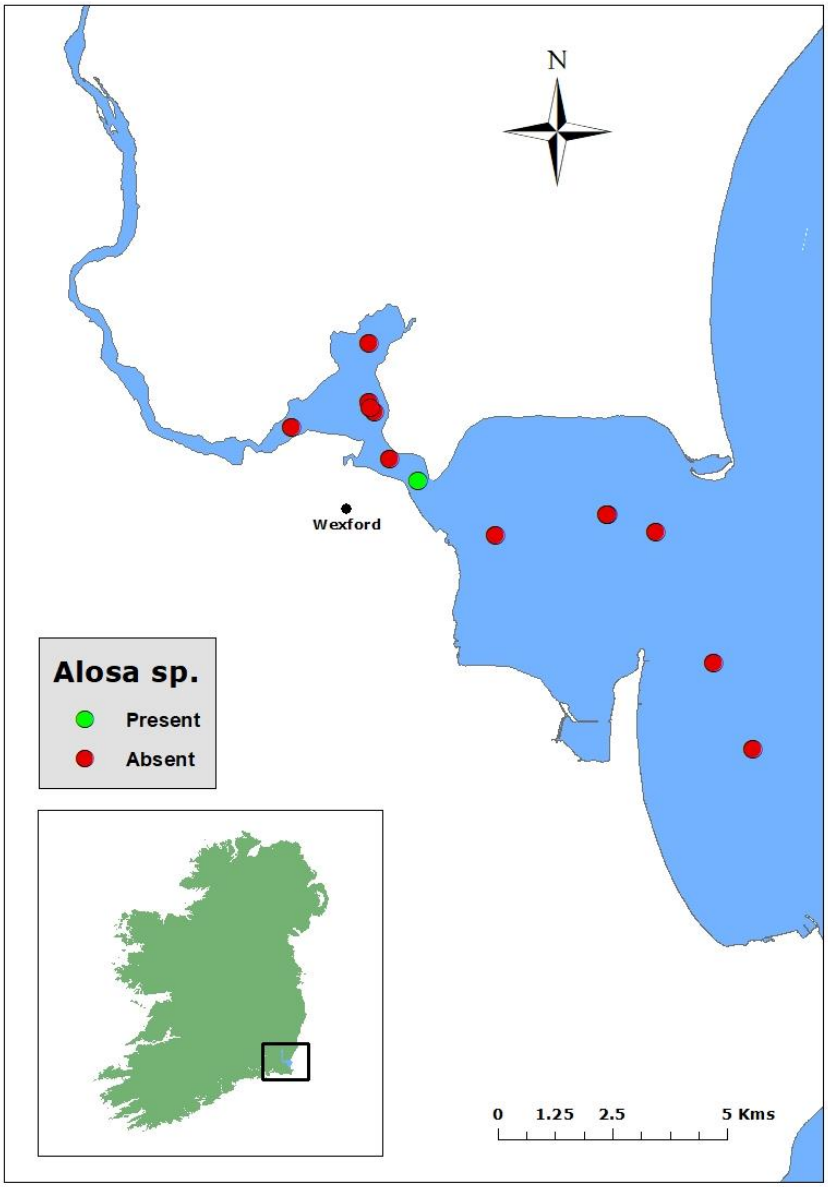


Figure 3.8. Incidence of capture of shad during the trawling survey transects (n=13) on the Slaney Estuary in September 2020.

3.3 Shad distribution in the Waterford Estuary (2010 -2020)

Shad presence has been recorded over the previous 10 years by Inland Fisheries Ireland (IFI) whilst undertaking a variety of survey work within the Waterford Estuary. Shad were recorded at 90 locations using trawling and seine netting techniques between 2010 and 2020 (Figure 3.9). Between 2011 and 2016, bongo netting surveys were undertaken on the Barrow, Nore and Suir, shad were recorded at 39 surveys. (Figure 3.10).

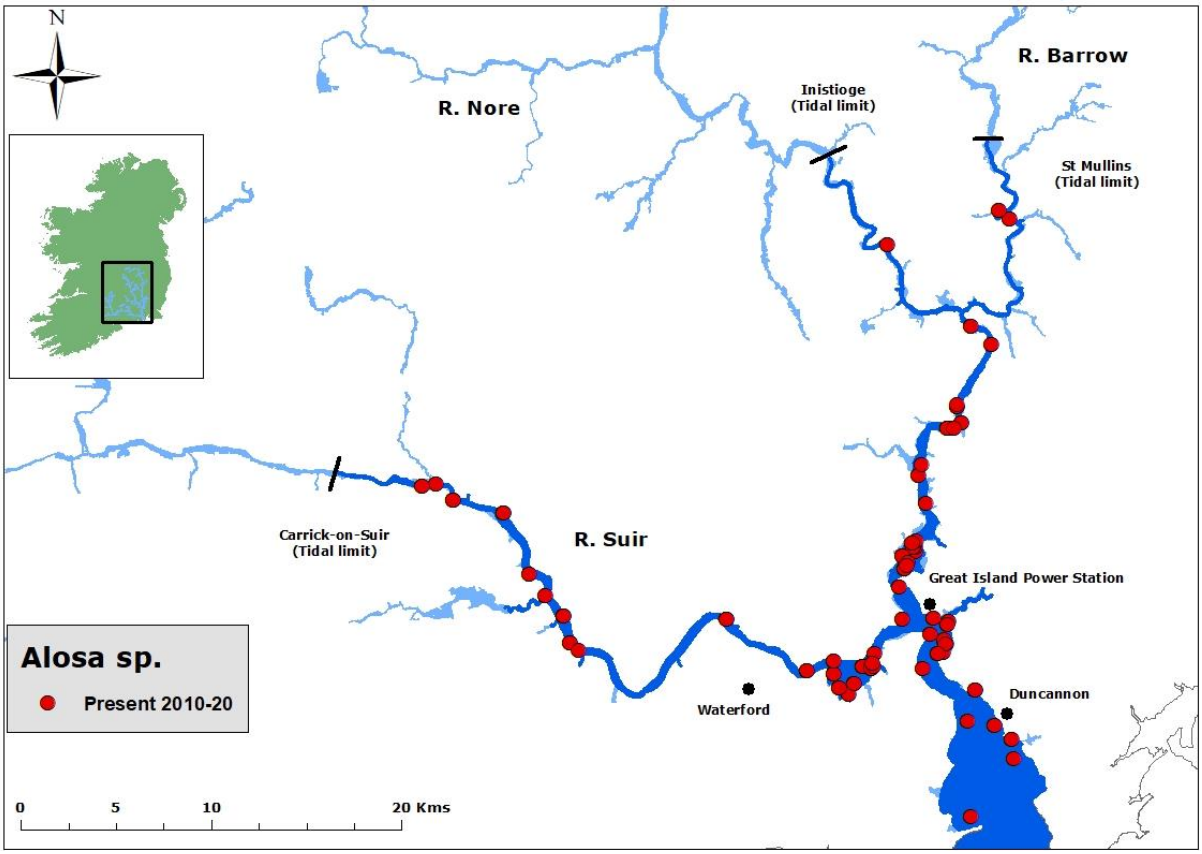


Figure 3.9. Locations where shad were captured during IFI trawling and seine netting survey work between 2010 and 2020 (n=90).

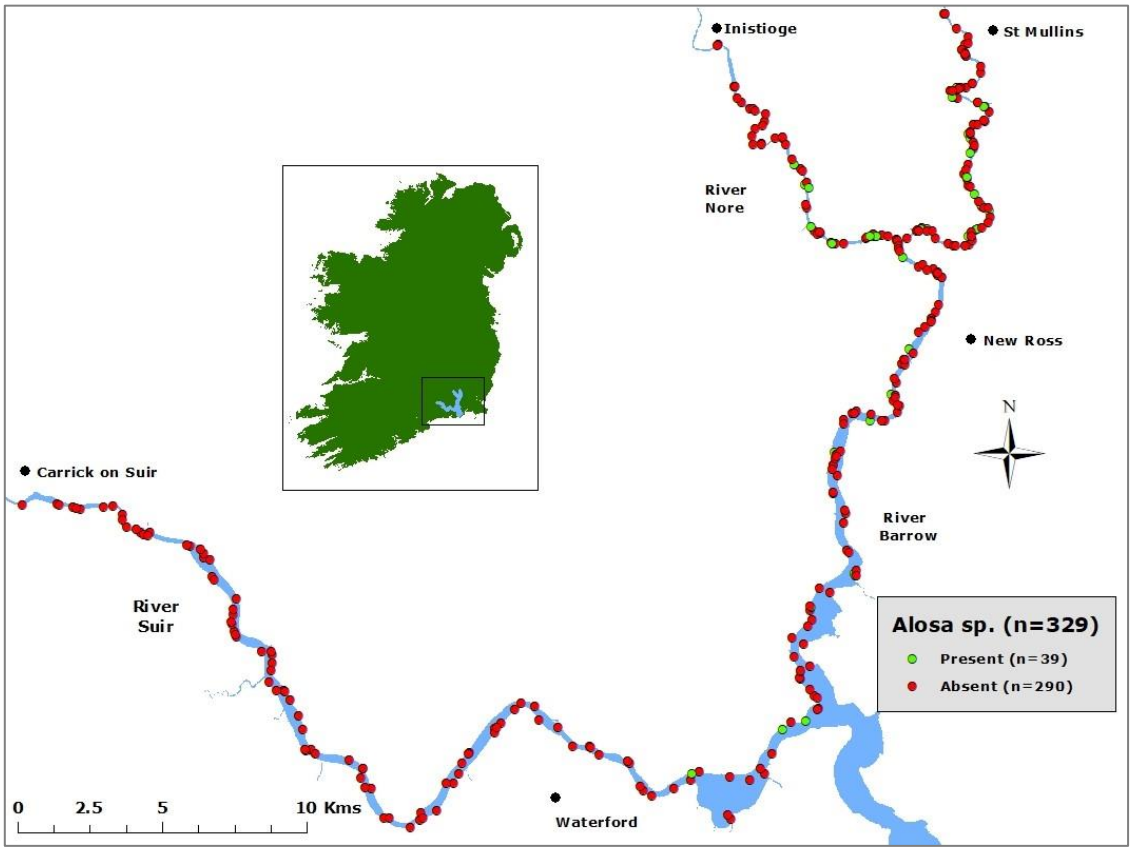


Figure 3.10. Bongo netting sites within the Waterford estuary from 2011 to 2016.

4. Smelt Programme

4.1 Juvenile smelt programme

4.1.2 Beach seine netting surveys August 2020

Beach seining surveys of the Barrow, Slaney and Munster Blackwater estuaries were carried out by the Bass Conservation Programme in August 2020. European bass (*Dicentrarchus labrax*) were the target species however juvenile smelt (*Osmerus eperlanus*) were also recorded from the Barrow and Munster Blackwater estuaries. As previously mentioned in (3.1.2 Beach seine netting surveys August 2020), the seine netting surveys took place immediately after the occurrence of Storm Francis on 24th and 25th of August 2020. The large freshwater influx into the respective systems may have had an impact on the outcome of these surveys. As with the shad seine netting, Covid-19 protocols were in place for the 2020 smelt surveys. This meant that social distancing, sanitisation practises and individual travel were all undertaken by the staff members involved. Fewer hauls were taken at each site as a result of the extra restrictions.

A Collins seine net was used to carry out the survey. This net measured 30.8m x 2m with a 14mm mesh size and a 5m central panel with a 6.5mm 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.

Seven seine net samples were taken at Fisherstown in the Barrow/Nore Estuary on the 26th August 2020 (Figure 4.1). Mean salinity was 2.17ppt with a mean water temperature of 18.2°C across the 7 net hauls. A total of 8 smelt were captured with their total lengths varying from 42- 84mm (average length 46.4mm)(Figure 4.2). This site is surveyed annually by the Bass Programme, in previous years 4 (2019), 376 (2018), 181 (2017) and 114 (2016) smelt were recorded.

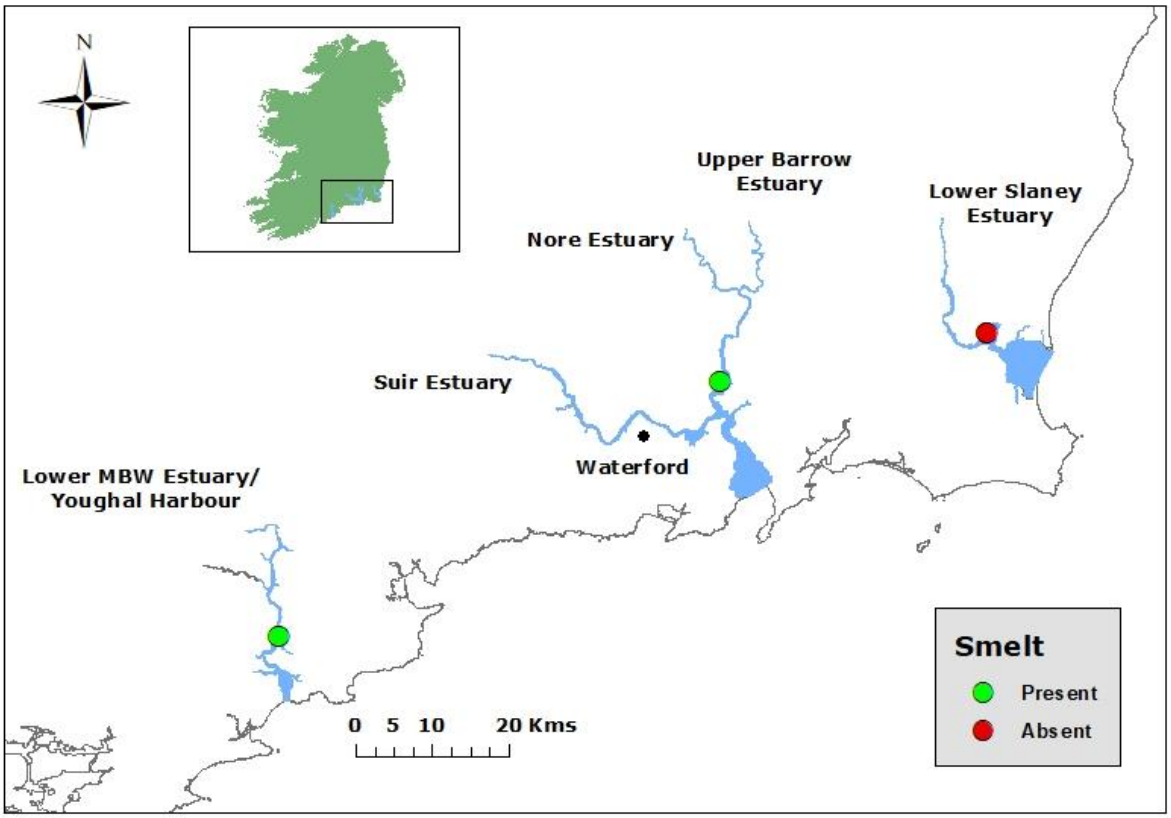


Figure 4.1. Locations of beach seine netting surveys in 2020 as part of IFI's National Bass Conservation Programme, with presence/absence of juvenile smelt.

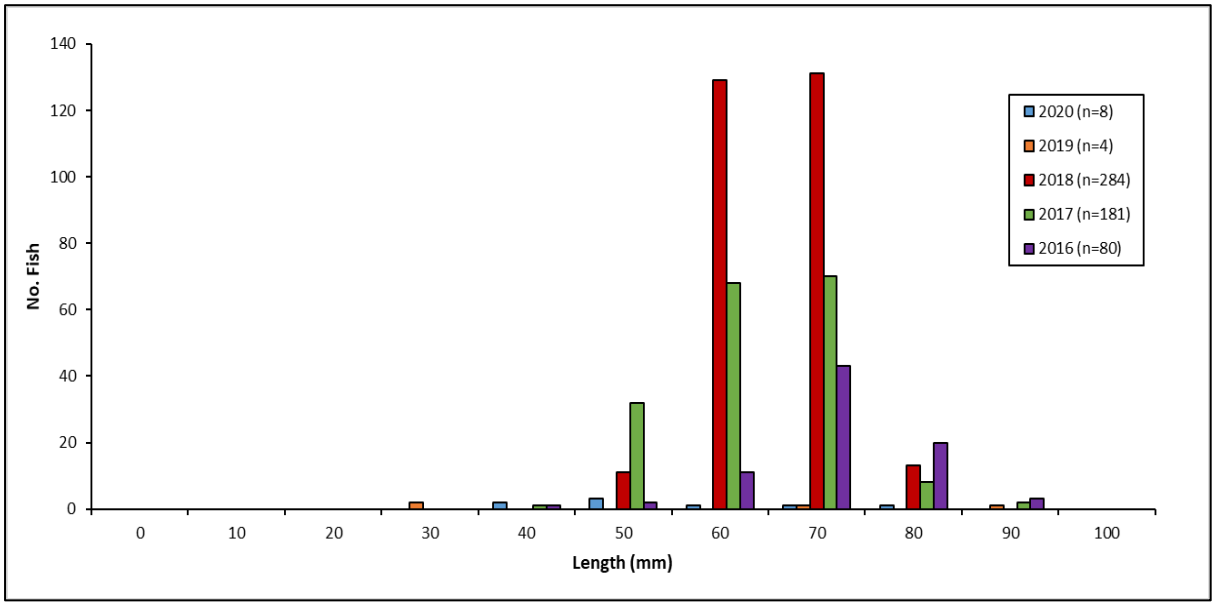


Figure 4.2: Length frequency of measured juvenile smelt from the Barrow estuary in 2020, 2019, 2018, 2017 and 2016.

A single location (Lickey Point) was surveyed in the Munster Blackwater Estuary on 28th of August 2020, five seine net samples were taken in total. A total of 30 juvenile smelt were

recorded over the 5 net hauls, ranging in total length from 64- 163mm (average 87mm)(Figure 4.3). Mean salinity was 0.82ppt on the day with a mean water temperature of 15.4°C.

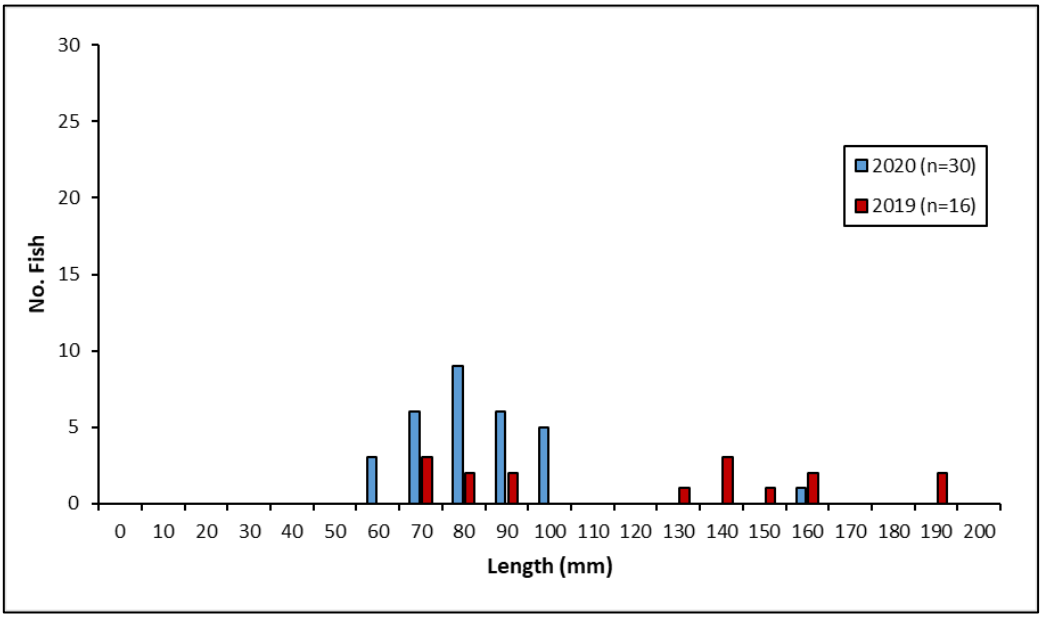


Figure 4.3. Length frequency of measured juvenile smelt from the Munster Blackwater estuary in 2020 and 2019.

Seine netting was undertaken at 'Marys Point' on the Lower Slaney Estuary on the 27th of August 2021. Five seine net samples were taken at this site however no smelt were recorded.

4.2 Trawling surveys

Smelt were captured during some of the trawling surveys documented previously (3.1 Juvenile shad Investigations). Twenty-one smelt, ranging in total length from 90- 250mm (average 200mm) were captured on the Barrow-Suir Estuary. These were captured in 8 out of the 18 transects that were carried out in the estuary (Figure 4.4). The highest abundance was recorded at trawl 8 'Deepwater' (n=9). Three smelt were captured during the trawling survey on the Munster Blackwater at trawl 10 (n=2) and 11 (n=1) respectively (Figure 4.5), average total length was 217mm. A single smelt was encountered on the Slaney estuary at trawl 10 measuring 220mm (Figure 4.6).

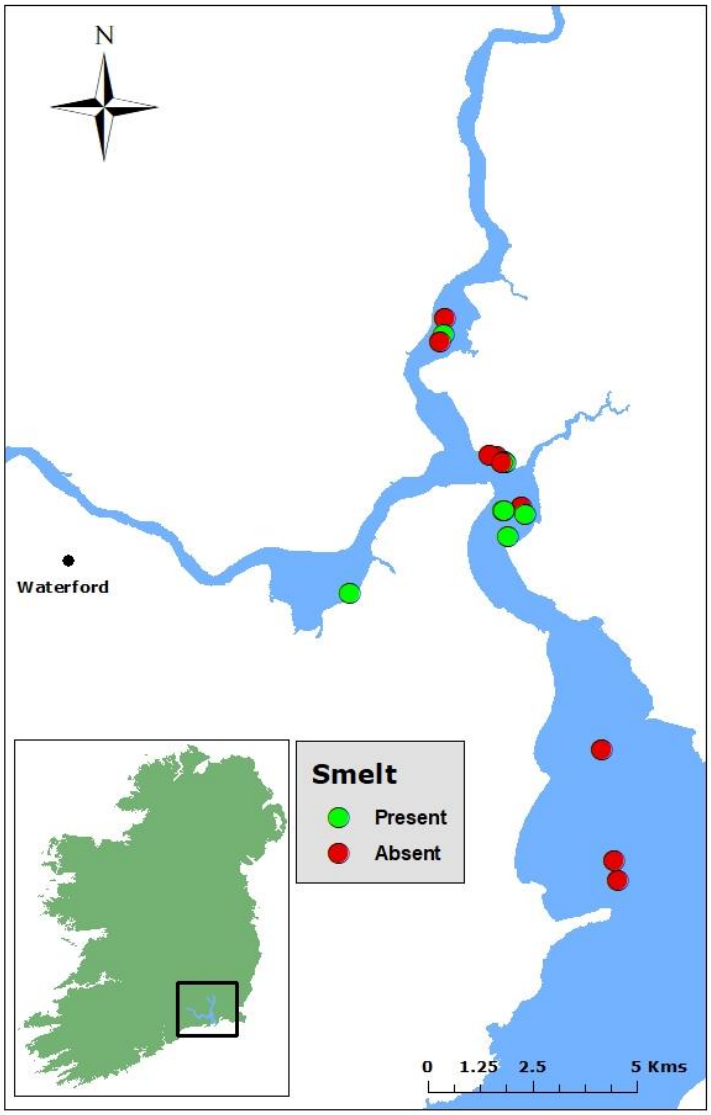


Figure 4.4. Incidence of capture of Smelt during the trawling survey transects (n=18) on the Barrow-Suir/ Waterford Estuary in September 2020.

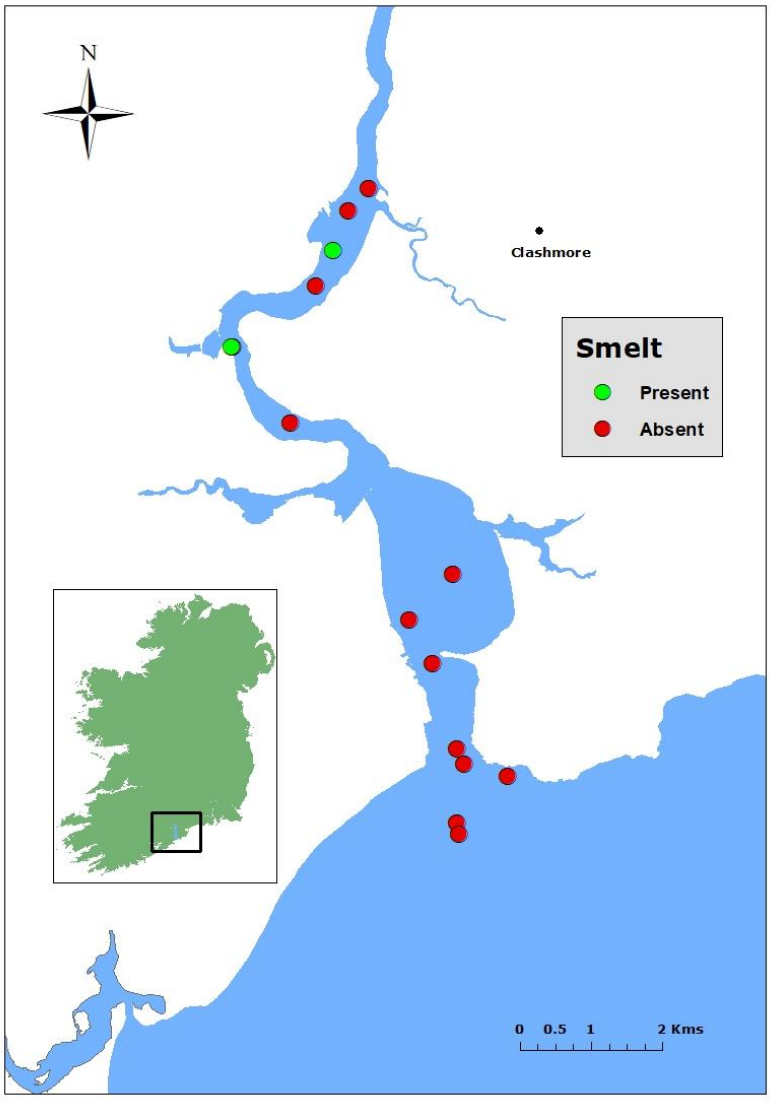


Figure 4.5. Incidence of capture of Smelt during the trawling survey transects (n=15) on the lower Munster Blackwater Estuary in September 2020.

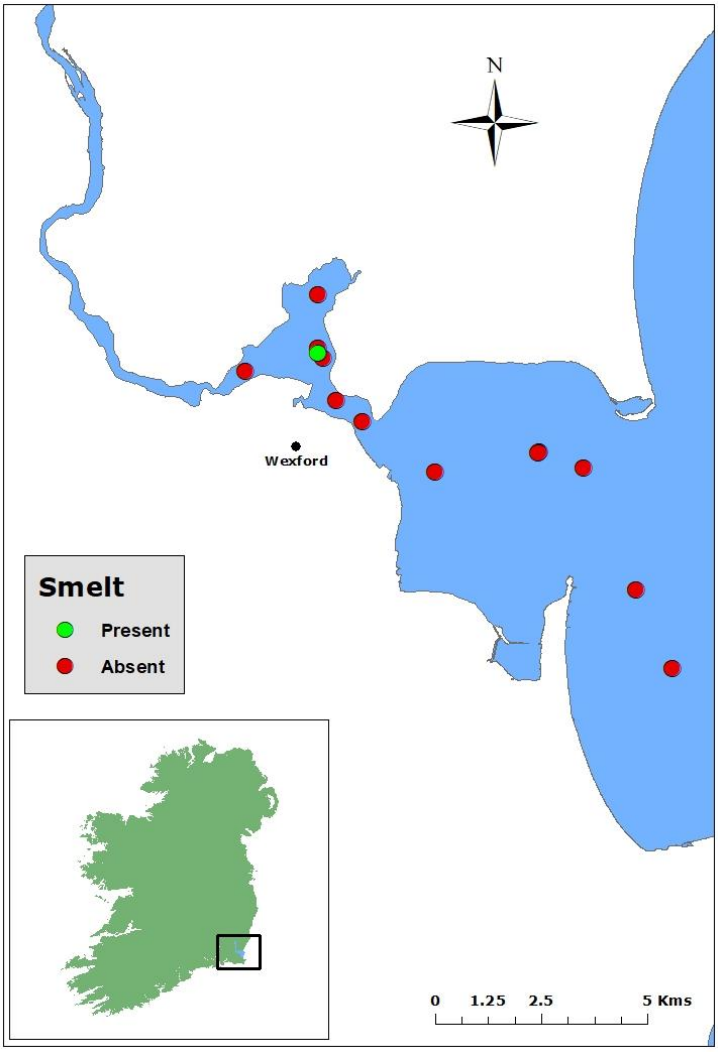


Figure 4.6. Incidence of capture of Smelt during the trawling survey transects (n=13) on the Slaney Estuary in September 2020.

5. Conclusions and Plans for Future Work

Despite the unprecedented circumstances associated with the Covid-19 pandemic, the majority of surveys for lampreys and shad were carried out in 2020. The monitoring programmes for the Annex II/V fish species will continue in 2021, which represents year 3 of the current 6-year reporting cycle, under Article 17 of the Directive.

As the current conservation status for river lamprey is 'unknown' due to a deficiency of data, there is a particular focus on assessing the range for this species in the current cycle (2019 – 2024). Notwithstanding the challenges and uncertainties in relation to Covid-19, every effort will be made to proceed with both adult spawning and juvenile surveys of the Nore and Suir catchments in 2021.

Annual sea lamprey hotspot surveys will continue and the Suir and Munster Blackwater rivers will be targeted as part of a rolling programme of float-over nest count surveys on the main channels of SAC rivers. The roll-out of the revised larval lamprey programme is on-going with planned repeat visits to index sites in 2021 to assess trends in the population size of brook lamprey. To investigate changes and trends in the range for this species, a number of range sites (to be sampled once per 6-year cycle) will be surveyed in 2021.

The important twaite shad spawning grounds at St. Mullins on the River Barrow will be the focus of an intensive sampling programme in 2021, to investigate the adult shad run, spawning behaviour and the impact of the weir as a substantial migration barrier. It is proposed to carry out eDNA water sampling and shad egg surveys on a weekly basis for a 6-week period during the spawning period April – June.

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