IFI/2012/1-4103

National Programme: Habitats Directive and Red Data Book Fish Species

Executive Report 2011

Iascach Intíre Éireann
Inland Fisheries Ireland

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1. Introduction

The Habitats Directive and Red Data Book fish programme focuses on those species listed in either Annex II or V of the Habitats Directive, the Irish Red Data Book or in both. The exception is the Atlantic salmon, which is investigated under national salmon programmes within IFI's R&D division. The species as a group are often referred to as the "conservation fish species", a reference to the fact that the majority are considered to be of vulnerable status and in need of conservation and protection. The majority are considered to be native species, the initial colonisers of Irish waters after the last glaciation and the pollan is considered to be at the most southerly extreme of the distribution range for the whitefish species.

The programme and its outputs provide an expanding data base to service Ministerial obligations under the Irish Habitats Directive Regulations and to service national requirements under the Biodiversity Programme. There is also a strong element of synergy and shared service, both with other teams within the Inland Fisheries service and with other state agencies, such as national Parks and Wildlife Service (NPWS) and Office of Public Works (OPW). During 2011, new legislation was brought forward designed to facilitate implementation of the EU Birds (1979) and Habitats Directives (1992) - the European Communities (Birds and Natural Habitats) Regulations 2011, or S.I.477 of 2011. These regulations have wide-ranging implications for Inland Fisheries Ireland and these will be fully teased out over time, working with our parent Department and with personnel from the Department of Arts, Heritage and Gaeltacht and with NPWS. The regulations, as with predecessor regulations, place an obligation on the fisheries Minister in regard to monitoring the status of fish species listed in the directives. In addition, the regulations identify roles for public authorities, such as IFI, engaged in licensing procedures within Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) in regard to requirements for screening and appropriate assessment of implications of actions within European sites. The regulations also bring forward legislation in regard to invasive species- both plant and animal, including fish species.

2011 also saw publication, by NPWS, of an updated Red Data Book on reptiles, amphibians and freshwater fish in Ireland (King *et al.* 2011). Senior staff in IFI R&D division were major contributors to this text. The review confirmed the status issues relating to the shads and lamprey species, as well as to pollan and char. However, the findings of recent Irish studies relating to smelt led to a reduced risk assessment for this species.

As each of the fish groups has quite distinct habitat and ecological requirements, the monitoring and status assessment programmes for each group are quite distinct. Progress on developing sampling protocols that are robust and repeatable, in statistical and

logistical terms, was made during 2011. A focussed sampling effort was launched in spring 2011 to complement previously-compiled data sets dealing with brook lamprey spawning habitat and habits. This led to submission of a manuscript to a peer-review journal. This has been accepted for publication and should be available during 2012.

Trials using bongo-nets to sample for larval and post-larval fish, particularly shad, were undertaken on the Barrow estuary with some success and auger well for further refinement. In addition, use was made of angling as a sampling tool for adult migrating shad, working with colleagues from IFI's Business Development unit. Valuable samples of rod-caught shad were collected in the Suir and Munster Blackwater and this strategy will be availed of again.

2. Lamprey Programme

2.1 Juvenile lamprey catchment-wide surveys:

Background - This package is operated on a catchment basis, with a focussed sampling effort at a predetermined number of sites spread along individual channels in a catchment, in habitat characteristic of juvenile lamprey (Figure 2.1). An electric fishing technique is used and a team consists of two staff members. The number of sites to be surveyed in a catchment is dependant on the catchment size and density of the channel network. Survey work is undertaken during the period August – October.

Figure 2.1. Electric fishing for juvenile lamprey and also juvenile lamprey captured during a survey on the Lee catchment.

Methods - Prior to commencement of the survey on a particular catchment, sites are pre-selected based on the area of a chosen catchment using ArcGIS 9, ArcMap Version 9.3.1. Ideally one site is located per 25 km^2 or 5 kilometre of river length. Generally sites are located adjacent to access points to a river. Site locations are transferred to the relevant Ordnance Survey Discovery series maps, with each location given a unique site code. The surveyor uses these to identify the location of the site and determine the suitability for juvenile lamprey.

At each site an area of deposition of fine-grained sediment was sought out, ideally in a location where it was safe to wade and undertake electric fishing. The most suitable sediment patch was selected for survey at any site. Some locations visited were, for various reasons, not suitable habitat for lamprey due to absence of fine silts, too high velocities or presence of extensive in-stream vegetation. In such cases an attempt was made to find an adjacent site where practicable. These adjacent sites were preferably at access points either up- or downstream on the same channel.

For each site a one meter square area was electro-fished for six x 20 second intervals adding up to a total of two minutes (after Harvey and Cowx 2003). Any lamprey observed were captured and measured for length and identified as either river/brook or as sea lamprey. Additional fish recorded outside the sampling area and attracted by the electric current were captured and recorded as 'extra' on data sheets. All lamprey captured were returned unharmed to the river/stream. At each site *a* Global Positioning System (GPS) reading was recorded, photograph taken, measurements of stream width and depth and also notes taken on vegetation present, flow regime and adjacent land use practises where relevant.

Sites classified as having "absence of suitable habitat" were a mixture of gravelled, stony beds, of field drains with no running water or were sites that were inaccessible due to bank slope and water depth - safety issues. Once a catchment was completed the status of lamprey present could be determined (Figure 2.2 & Table 2.1).

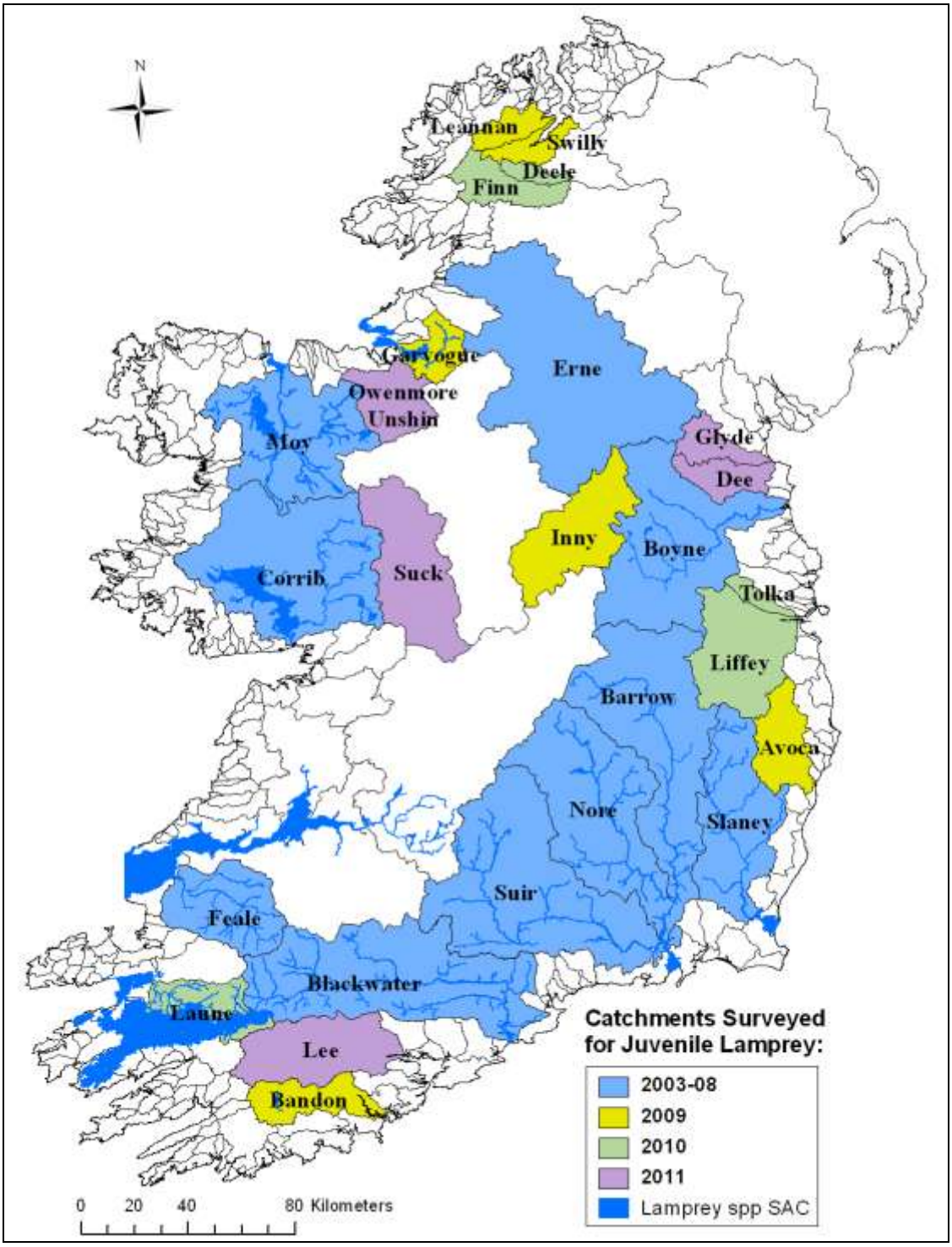

Figure 2.2. Map identifying catchments surveyed to date for juvenile lamprey including lamprey designated SACs.

Table 2.1. Summary lamprey data from catchments surveyed in 2011.

Catchment	Date (2011)	No. Sites	No. Suitable Sites	No. Positive Sites	Density Range (no./m^2)	Brook/River Juveniles	Sea Juveniles	Transformers
Suck	08	63	48	31	0 - 30	yes	no	yes
Glyde	09	22	10	8	0-21	yes	no	yes
Dee	09	23	7	6	0-18	yes	no	yes
Owenmore-Unshin	08-09	29	13	5	0-14	yes	no	yes
Lee	09-10	50	41	26	0-29	yes	no	yes

2.1.1 The Suck Catchment

The source of the River Suck is upstream of Lough O'Flynn in County Mayo. It is one of the main tributaries of the River Shannon draining an area of 1597 km^2. It flows for *circa* 90 kilometres through the towns and villages of Castlerea, Ballymoe, Donamon, Castlecoote, Athleague, Ballyforan and Ballinasloe to where it meets the River Shannon at Shannonbridge (Figure 2.3). A number of tributaries join the River Suck along its course, the larger of which include the Island River, Deerpark River and the substantial Shiven River which joins the Suck upstream of the village of Ballyforan. Sections of the catchment are drained and managed by the River Suck Drainage Board. Surveying of the River Suck for juvenile lamprey was undertaken in August 2011.

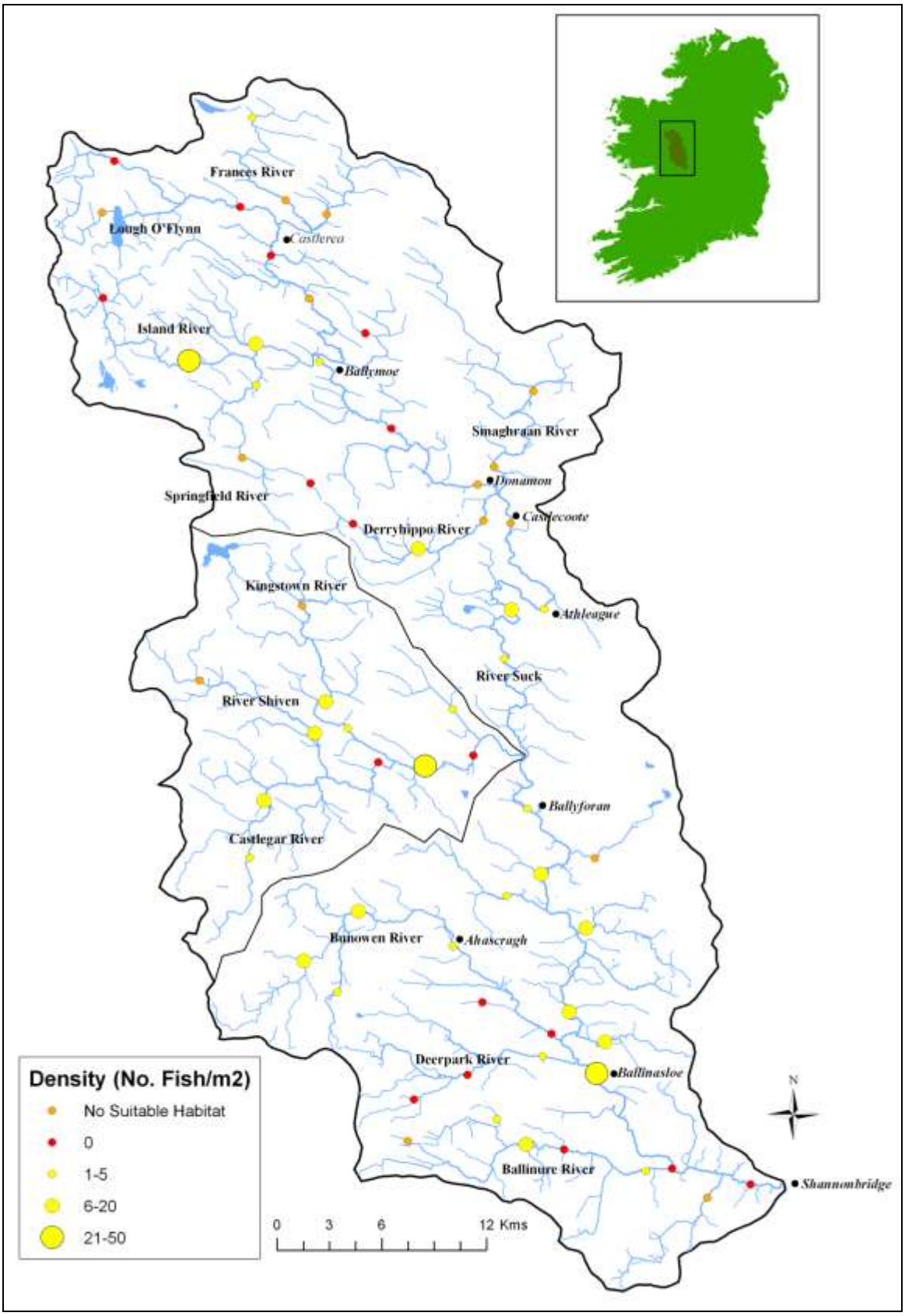

Figure 2.3. Map of the Suck catchment indicating sampling locations and densities recorded.

Mean densities of juvenile lamprey were calculated from the individual channels surveyed (Figure 2.4). Only sites where suitable habitat was identified are presented (Figure 2.3). Zero values were included at sites where suitable habitat was identified but no lamprey were present. The mean density of lamprey recorded on the River Suck main channel was 4.69 fish/m^2, based on sampling at thirteen sites. Lamprey were present at eight of these sites.

The Island River, a tributary of the River Suck was sampled at three locations. Lamprey were present at two of these sites, the mean density of juvenile lamprey was 10.33 fish/m^2. A number of other channels also displayed high mean densities of fish including the Killeglan (12 fish/m^2), and the Castlegar (12 fish/m^2), the Clonbrock (10.25 fish/m^2) and the River Shiven (10.25 fish/m^2).

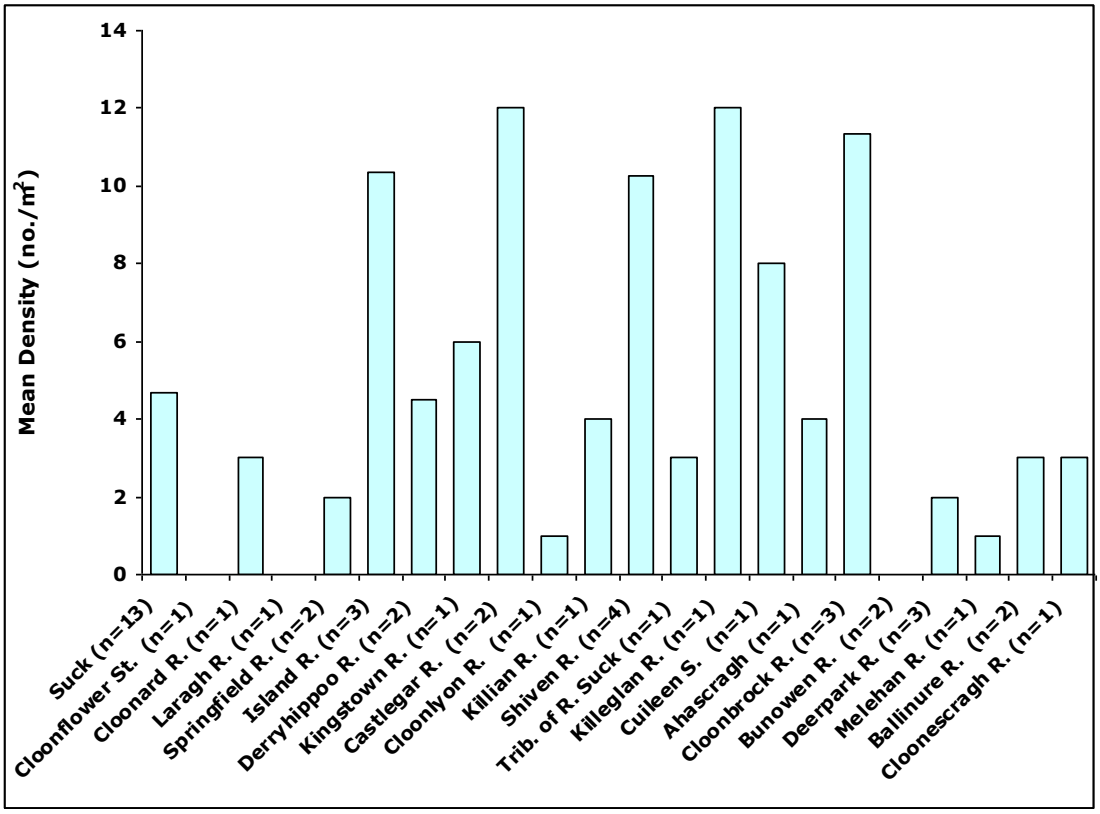

Figure 2.4. Mean densities of juvenile lamprey recorded at sites with suitable habitat across the Suck catchment (No. Suitable sites=48).

In total, 276 individuals were captured across the Suck catchment. Length frequency analysis indicated a population distribution with representation of a number of age classes. This indicated a good conservation status. Recent recruitment was evident in the 10 to 20mm size class (Figure 2.5). Eleven fish were captured in transformation stage, measuring between 109 to 135mm. All of the juvenile fish captured were brook/river lamprey. No sea lamprey juveniles were captured.

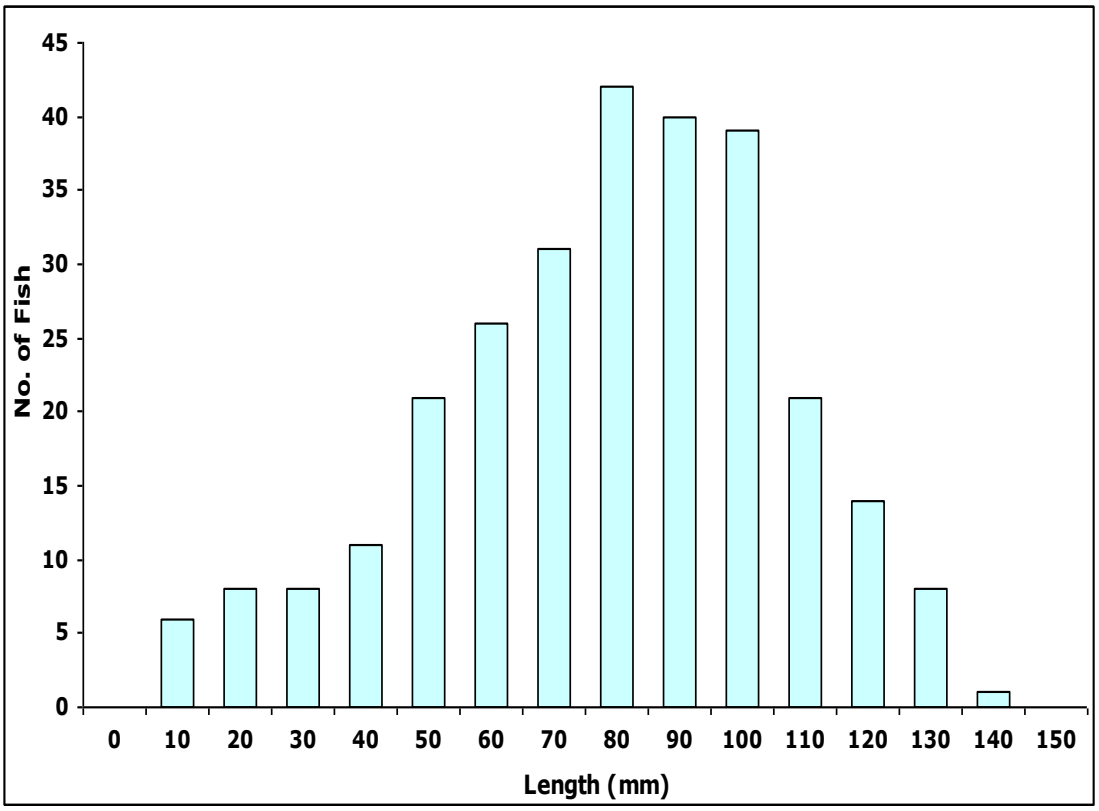

Figure 2.5. Length frequency distribution of juvenile lamprey across the River Suck catchment (n=276, no. of positive sites=31).

2.1.2 The Glyde and Dee catchments

The Rivers Glyde (391 km^2) and Dee (347 km^2) drain most of mid Louth in the north east of the country. Both rivers rise on the Cavan - Monaghan borders with Louth at an altitude of *circa* 300 meters and flow in an essentially easterly direction (Figure 2.6). They join together 1 kilometre from the sea in Annagasen at the southern end of Dundalk Bay.

The Glyde has two principal tributaries namely the Longfield, draining the Carrickmacross area, and the Lagan River, rising in the hinterland of Kingscourt. The Kilmainham River forms the upper reaches of the River Dee. Further downstream, the Dee has major sub-catchments in the Garra, Killary Water, Keeran and the White River.

The catchment was drained by the Office of Public Works (OPW) under the Marshall Aid Scheme in the mid 1950's. The OPW continues to undertake channel maintenance on those waters arterially drained in the 50s. Intensive farming is undertaken in the combined catchments, with large-scale tillage.

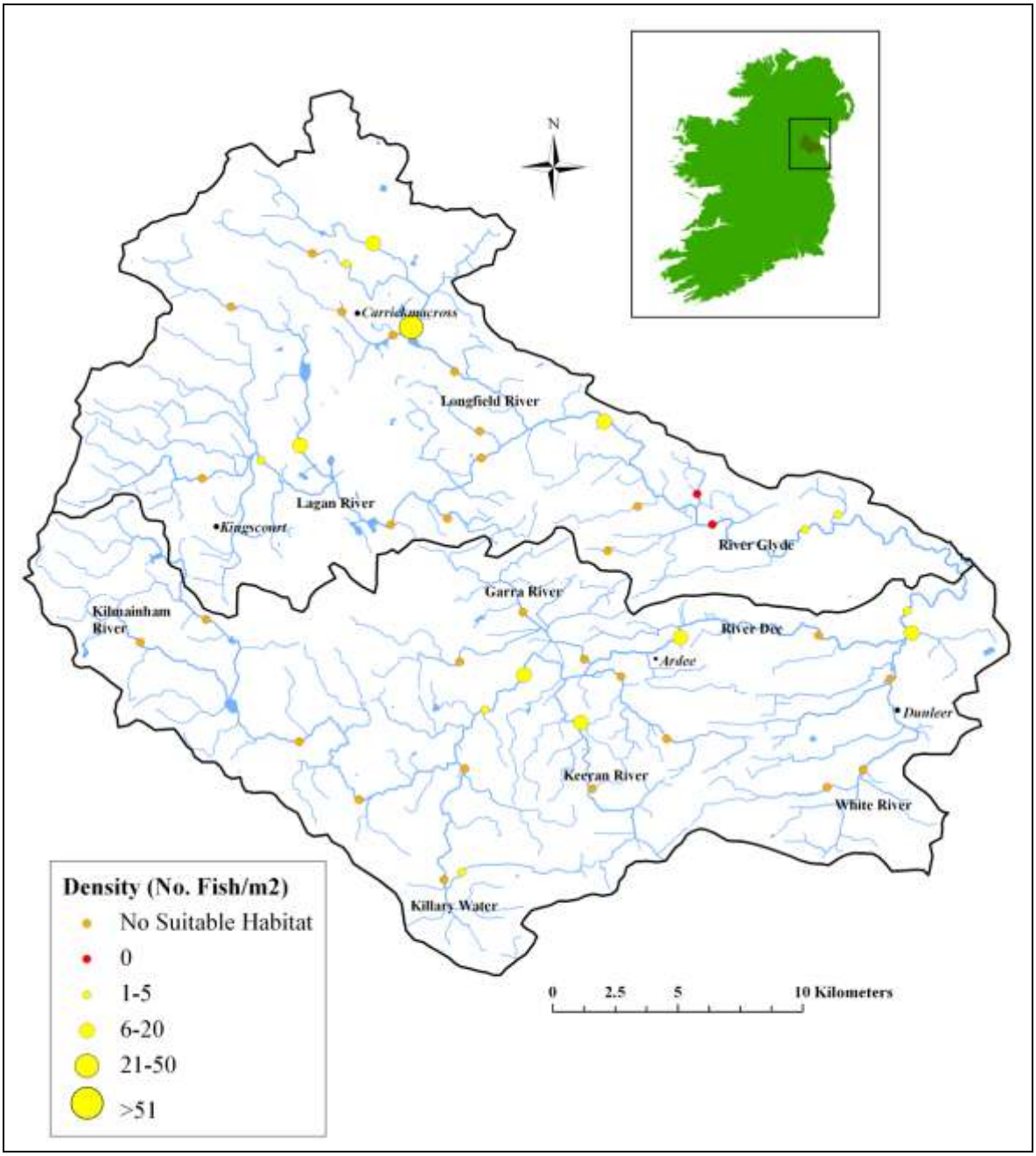

Figure 2.6. Glyde - Dee catchment showing major tributaries and sampling stations, Autumn 2011.

The main stem Glyde and its smaller tributaries, downstream of the Lagan and Longfield systems, contained five locations of suitable sedimenting habitat. Three of these were positive, with densities of fish recorded between 2 and 10 fish/m^2. The two negative sites had substantial deposits of fine sediment. The density values recorded at positive sites in the Glyde ranged from 1 - 21 fish /m^2 (Figure 2.7).

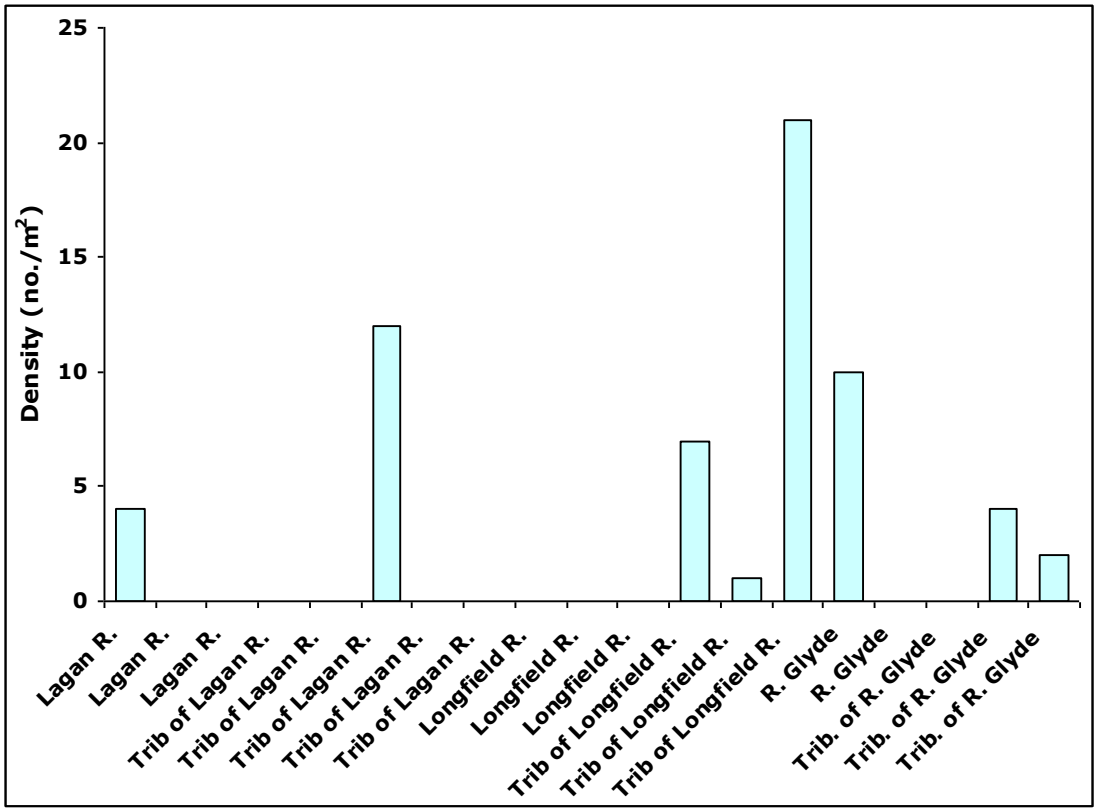

Figure 2.7. Density of Juvenile lamprey on the Glyde catchment (no. of sites=19).

The overall population structure of juvenile lamprey in the Glyde indicated the presence of a series of size classes, corresponding to different age groups, with modal peaks at 70, 100 and 130 mm (Figure 2.8). The largest number of juveniles were recorded in the larger size classes. The smaller numbers of younger fish and the paucity of fish in the 20 - 50 mm size range point to low levels of spawning success and recruitment into the overall population.

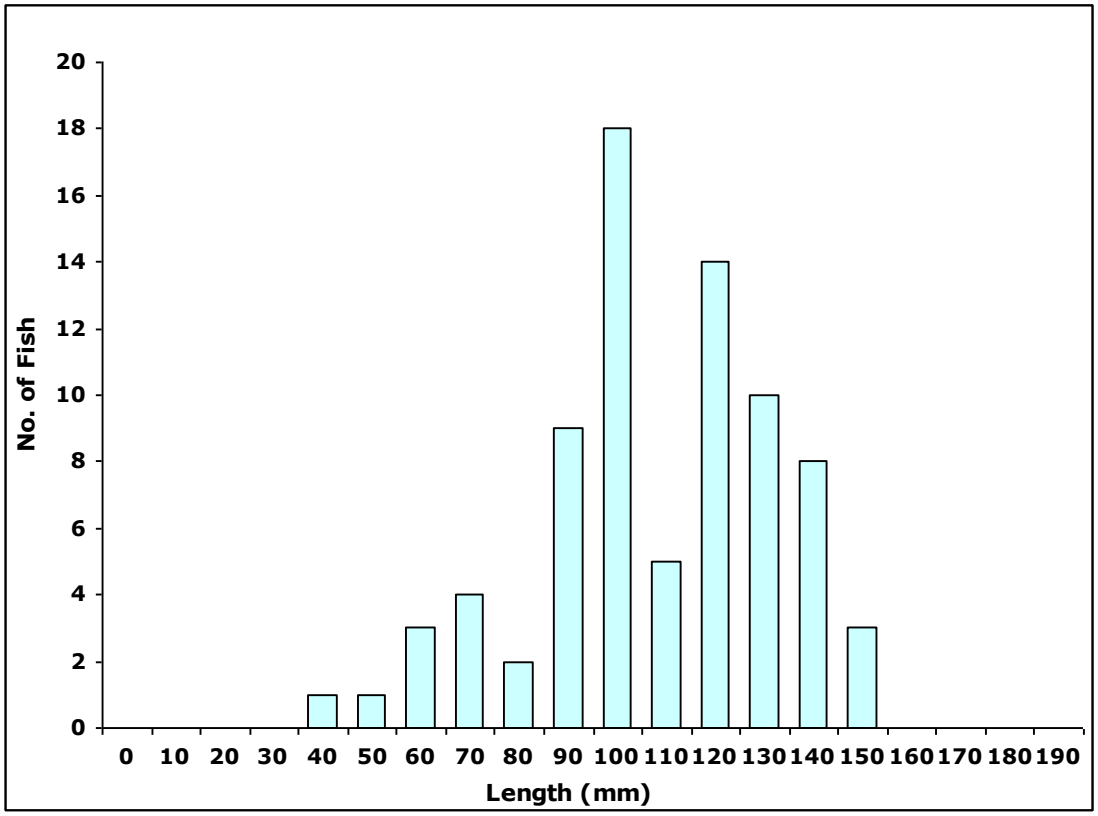

Figure 2.8. Length Frequency of juvenile lamprey, on the Glyde catchment (n=78, no. of positive sites=8).

Most of the lamprey recorded in the Dee catchment were located on the main channel of the Dee, beginning at the Hem Bridge where there were good silt deposits with resident juvenile lamprey recorded, and again at Bogie Bridge where a further positive site was examined (Figure 2.9). A characteristic 'alcove site' was discovered under an open span bridge on the Ardee by pass where 11 lamprey were recorded including one transformer, immediately downstream of the Ardee sewage treatment plant outfall.

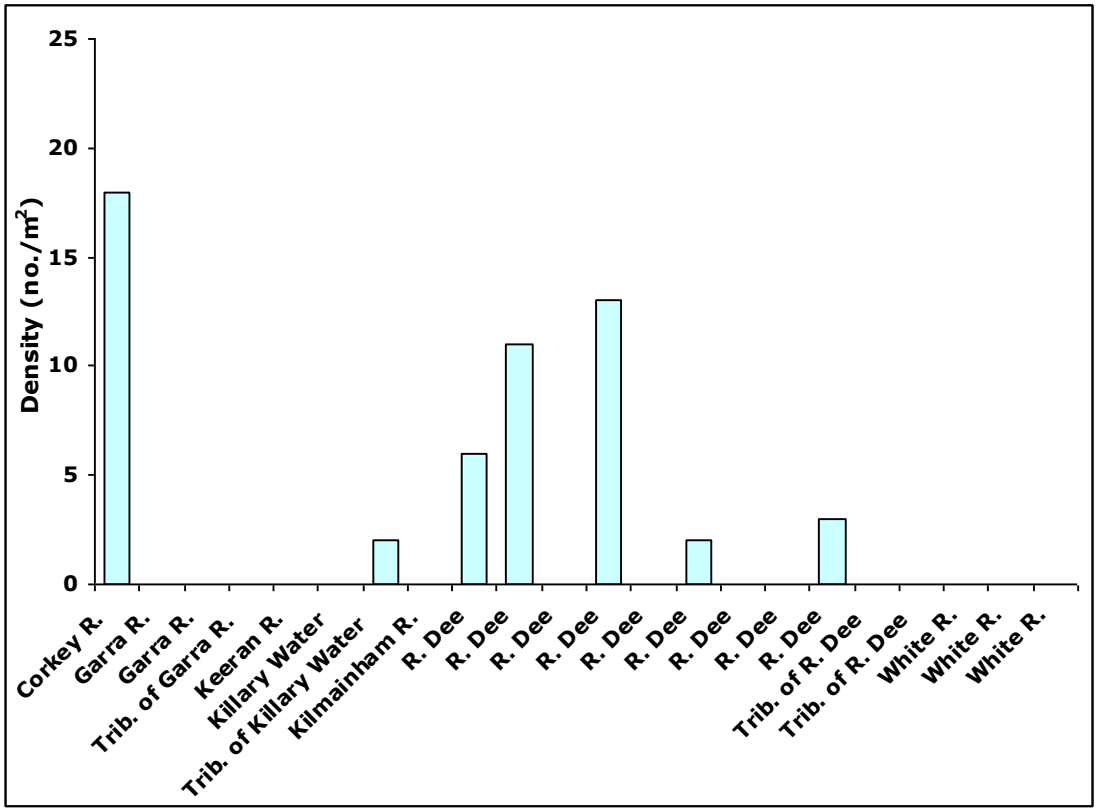

Figure 2.9. Density of Juvenile lamprey on the Dee catchment (no. of sites=22).

Positive sites on the Dee were more focussed into the middle and lower reaches of the catchment, primarily on the main stem. Density values varied widely from 1 - 18 fish/m^2 (Figure 2.10). Sizes ranged from 50 mm to 190 mm with a series of modal peaks indicating the presence of a number of age groups. A number of the larger fish were transformers, metamorphosing into young adult fish. The population structure was not as strongly skewed towards larger sized individuals as in the case of the Glyde. However, as with the Glyde material, the paucity of fish in the 20 - 50 mm size range points to low levels of spawning success in the last two years and of recruitment into the overall population.

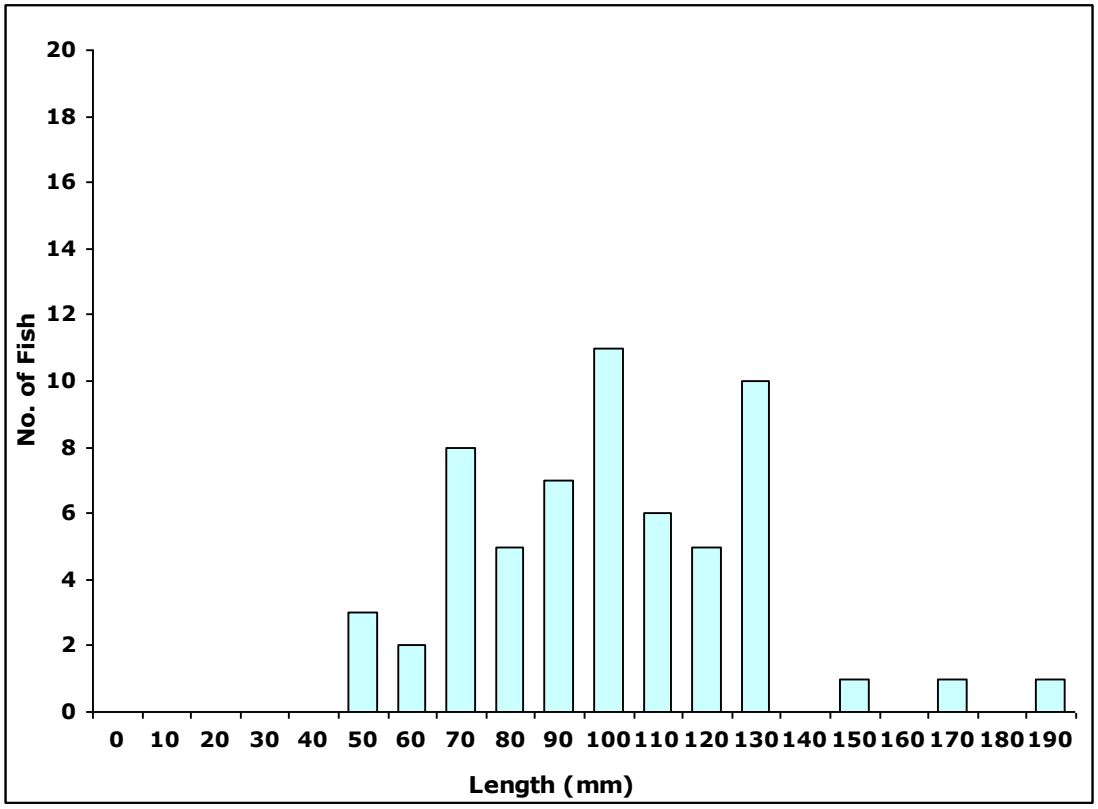

Figure 2.10. Length Frequency of juvenile lamprey, on the Dee catchment (n=60, no. of positive sites=7).

2.1.3 The Owenmore-Unshin Catchment

The Owenmore-Unshin catchment covers an area of 655 km^2, predominantly in County Sligo but with small extensions into Counties Mayo and Roscommon. It is bounded by the Curlew Mountains (264 meters) on the south side and the Ox Mountains (514 meters) on the north and north-west. The eastern edge is marked by the low hills above Lough Arrow and the western by the ridge north of Tobercurry. The catchment is divided into three sections by its three tributaries: the Owenbeg flows east along the foot of the Ox Mountains, the Owenmore northwards through the centre of the catchment and the Unshin north-west from Lough Arrow. The Owenmore River flows for *circa* 52 kilometres where it is joined by the Owenbeg River upstream of Collooney (Figure 2.11). Downstream of Collooney the Owenmore River is joined by the Unshin River and becomes known as the Ballysadare River for its final 4 kilometres to Ballysadare where the river enters the sea.

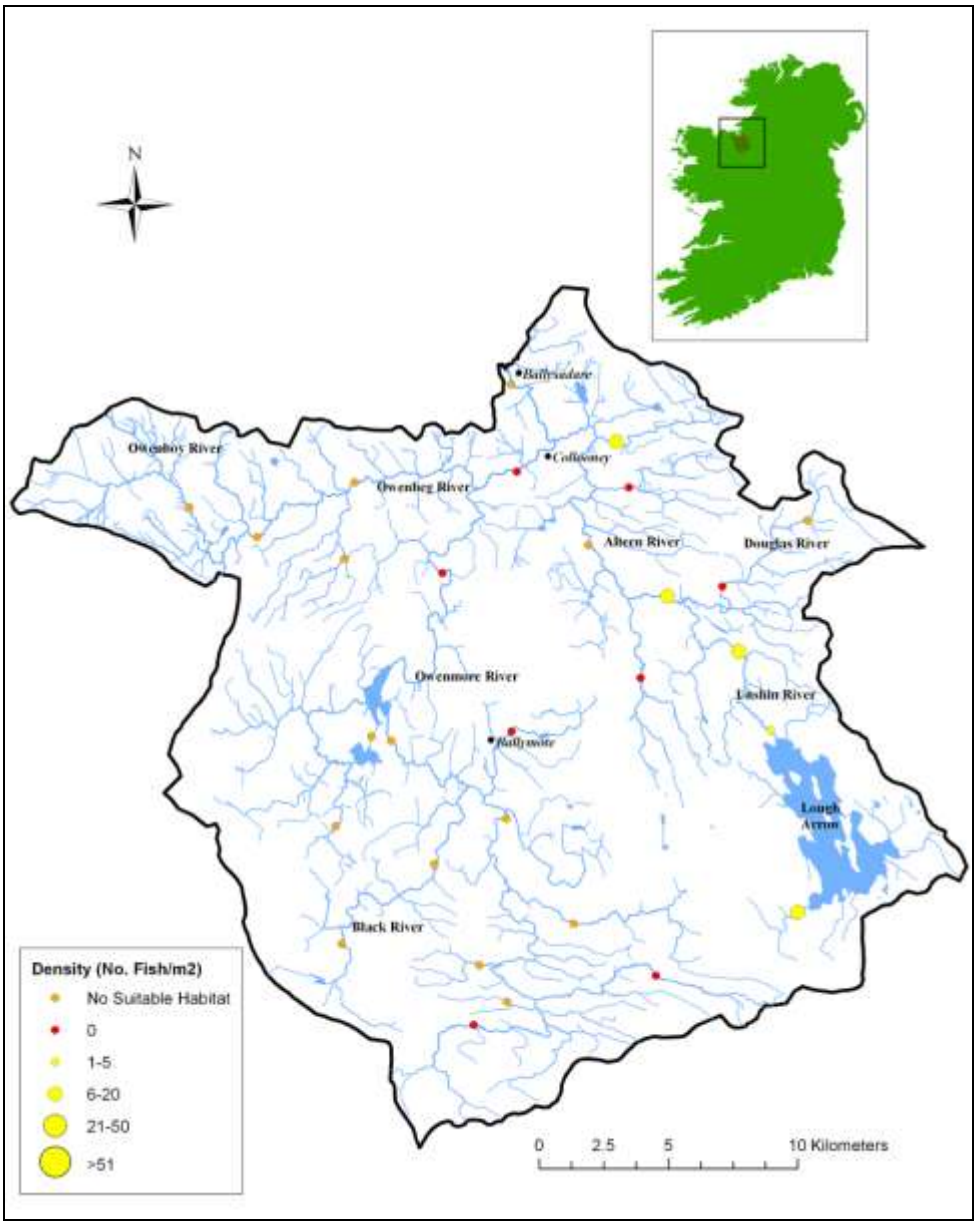

Figure 2.11. Map of the Owenmore-Unshin catchment indicating sampling locations.

Four sites were selected in the Owenbeg sub section of the catchment. No suitable habitat was identified at any of these locations. On the Owenmore main channel and tributaries thirteen sites were sampled. Of these there was no suitable habitat present at nine sites. No juvenile lamprey were recorded at any of the four sites which presented with suitable habitat. Ten locations were sampled on the River Unshin and tributaries. Of these, there was no suitable habitat at two sites. The remaining eight sites had juvenile lamprey present at five sites. These were the only sites across the catchment to have juvenile lamprey present (Figures 2.11 & 2.12). The density of fish recorded varied between 0 and 14 fish/m^2.

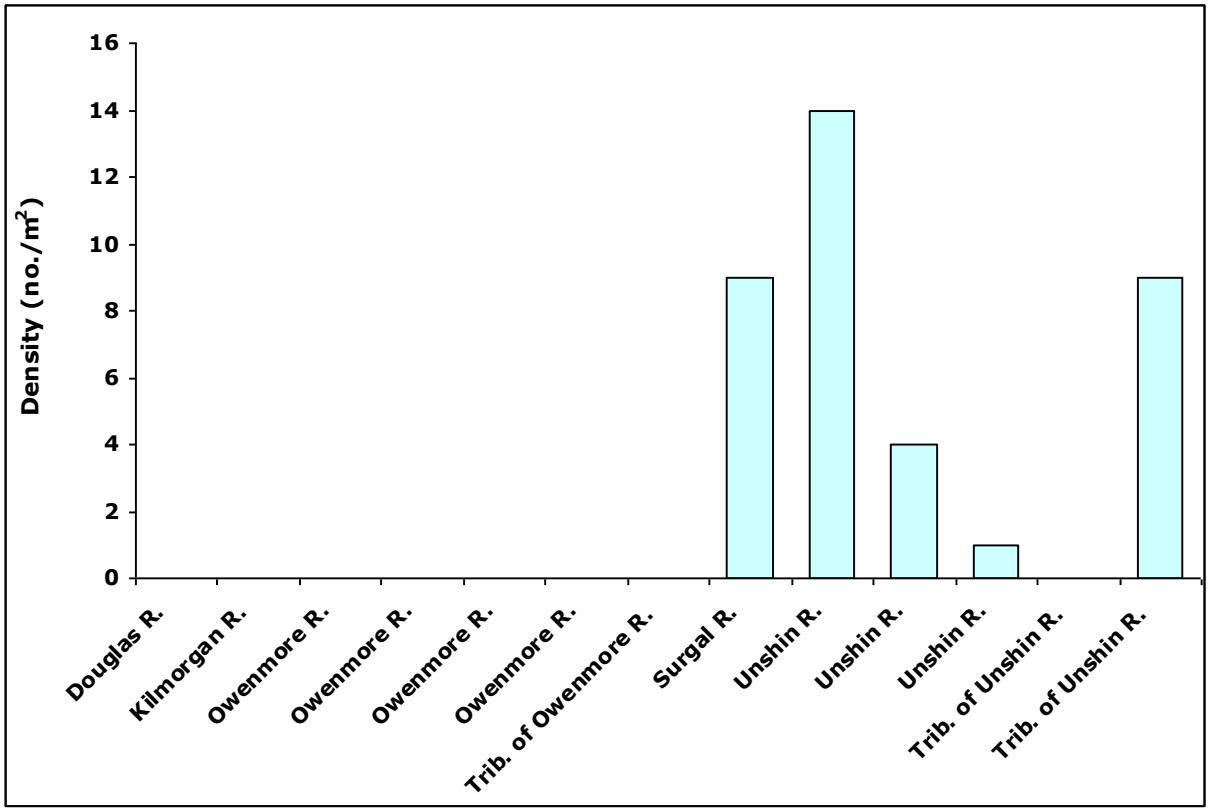

Figure 2.12. Density of Juvenile lamprey on the Owenmore-Unshin catchment (no. of suitable sites=13).

The length frequency distribution of juvenile lamprey on the Unshin sub-catchment indicated a number of modal peaks (Figure 2.13). Lengths of juvenile lamprey varied between 12mm and 138mm. The modal peaks were identified in the 40mm and the 80-90mm size classes. From this it can be deduced that a number of different year classes were present. The number of individuals captured across the catchment was lower than populations recorded in similar catchments. This was partially due to the number of sites which lacked suitable habitat for juvenile lamprey to colonise.

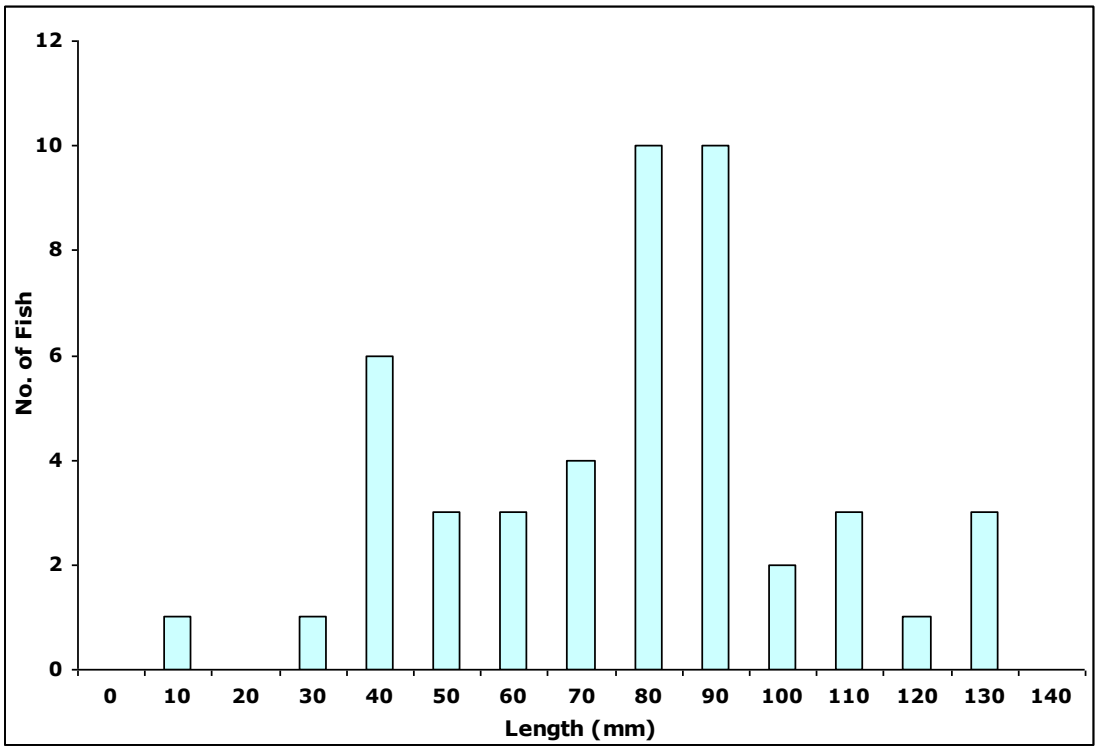

Figure 2.13. Length Frequency of juvenile lamprey, on the Unshin sub-catchment (n=47, no. of positive sites=5).

2.1.4 The Lee catchment

The Lee is one of the major river catchments in the southwest of the country, draining an area of 1,252 km^2. It comprises several sub-catchments; the Lee, Sullane, Foherish, Laney, Bride, Dripsey and Shournagh rivers, respectively. The Lee rises in the Shehy Mountains on the Kerry-Cork border, flowing eastwards from Gouganebarra Lake. At Ballingeary it is joined by the Bunsheelin River. Between the towns of Ballingeary and Inchigeelagh, the Lee forms Lough Allua, the first of a series of lakes along its length, the remainder of which are artificially impounded with some serving as reservoirs. The Bealaphadeen Stream enters Lough Allua from the south. From Inchigeelagh, the Lee flows east/north-east towards Macroom. Along this stretch it is joined by the Cooldorragha and Toon Rivers. Two kilometres further downstream of the latter confluence, the Lee enters the first impounded waterbody, the Gearagh. This is in turn is followed by Carrigadrohid and Inniscarra reservoirs, respectively. Levels in both are maintained and managed by substantial dams, each capable of generating hydroelectric power. The Buingea River enters Carrigadrohid reservoir from the south whilst the Glashagarriff River enters the Inniscarra reservoir 2.5 kilometres downstream of the Carrigadrohid dam. Downstream of Inniscarra dam the Lee flows eastwards through Ballincollig and into Cork city where it becomes tidal a short distance upstream from Sunday's Well. River levels and flow in this section of the river are highly variable depending on electricity generation and release of excess water from the reservoirs (Figure 2.14).

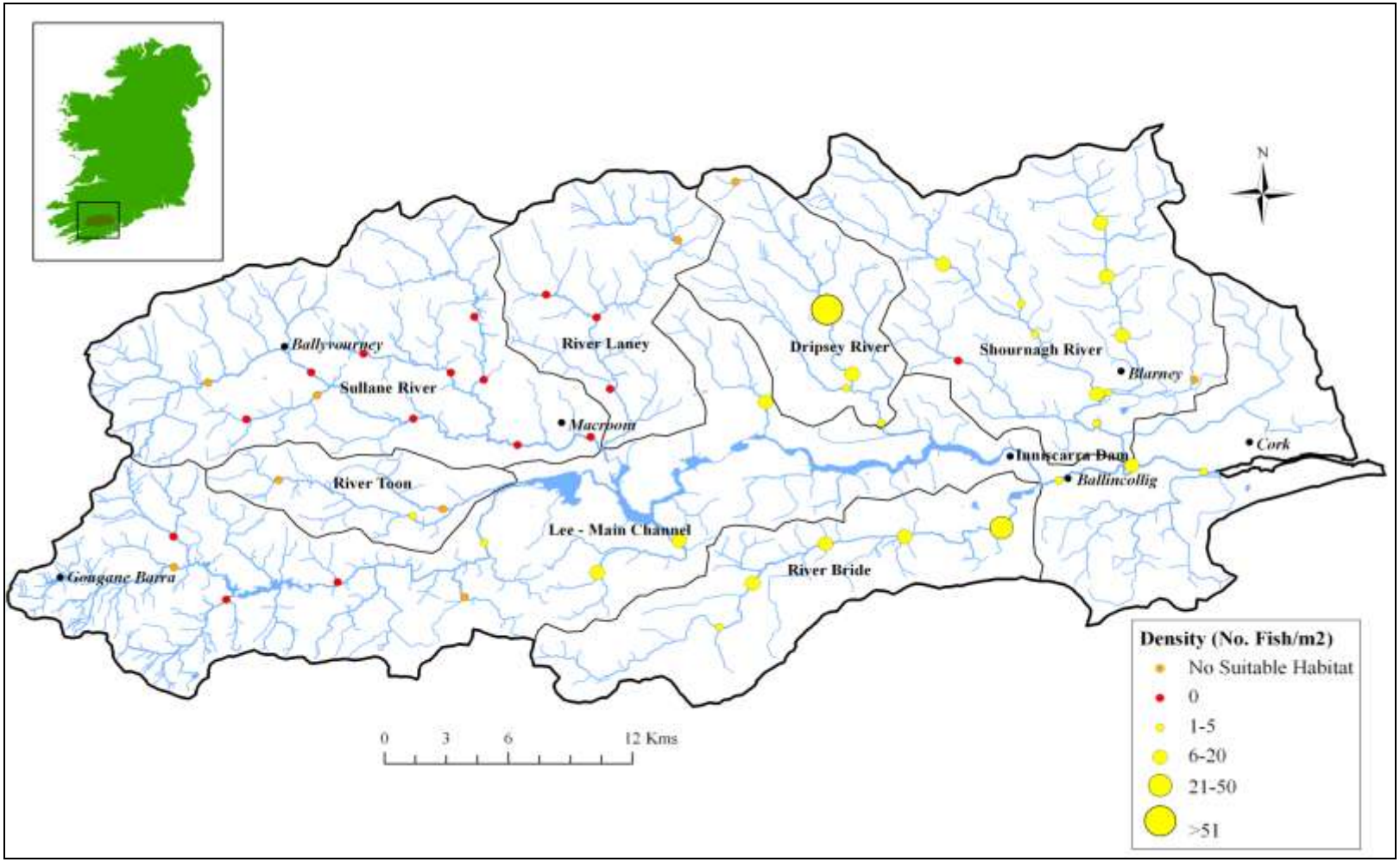

Figure 2.14. The Lee catchment, with principal tributaries, sampling points and juvenile lamprey status displayed.

The River Lee and some of its minor tributaries were sampled at 15 sites along the entire length between the source, Gouganebarra Lake, and the tidal limits in Cork city. Juvenile lamprey were absent at seven locations (Figure 2.15). Four of these sites, all in upland areas, were lacking suitable ammocoete nursery habitat. The remaining three sites, all located upstream of Inchigeelagh, had suitable habitat. Presence was confirmed at eight sites, with densities ranging from 1 to 9.7 individuals per m^2. The latter density was recorded at Athsolis Bridge on the Buingea River, close to the Carrigadrohid reservoir.

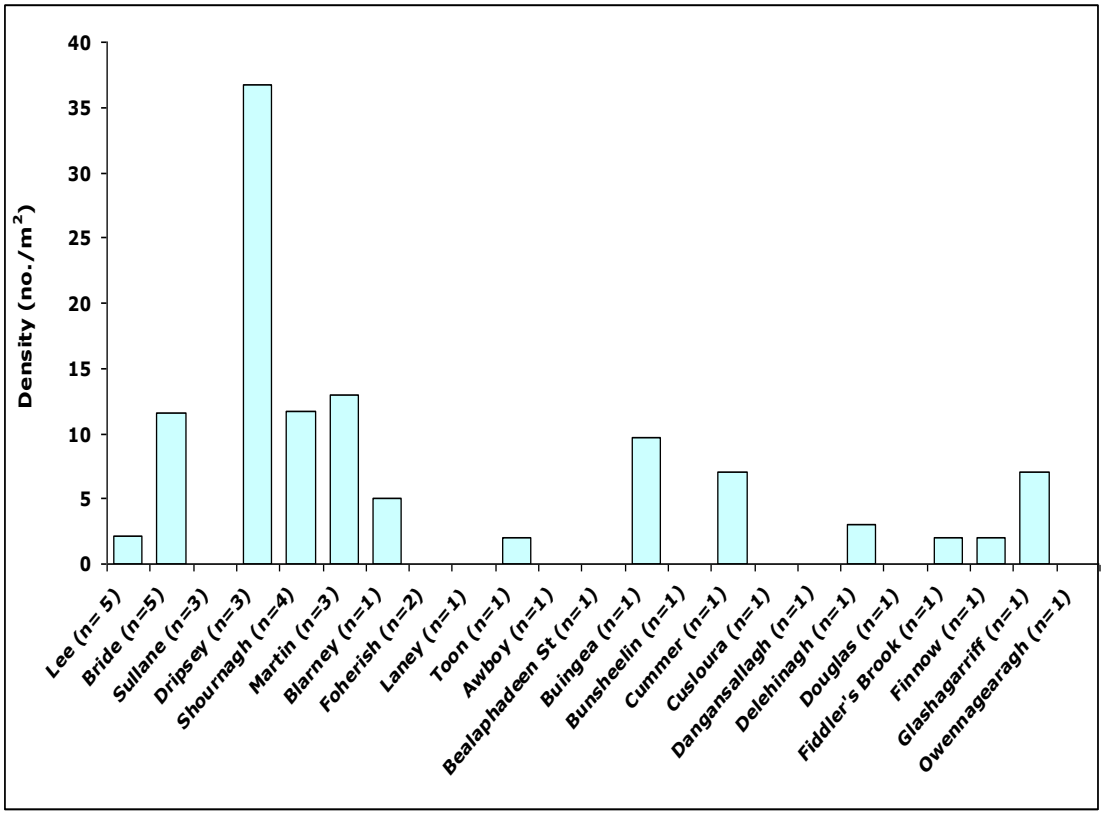

Figure 2.15. Density estimates of juvenile river/brook lamprey (no./m^2) on the River Lee and tributaries (no. of sites=41).

Length-frequency data were available for 260 individuals captured across the 26 positive sites in the catchment (Figure 2.16). Recorded lengths ranged from 19 to 137mm (average = 83mm). This sample also contained 13 transformers captured across five sites, ranging in length from 110mm to 121mm (mean = 116mm). All ammocoetes captured were identified as juvenile river/brook lamprey. No sea lamprey ammocoetes were encountered. Average densities encountered ranged from 0 to 88 individuals per m^2 (average = 5.9 per m^2). At sites where semi-quantitative electric-fish surveying was undertaken (n=32), densities ranged from 0 to 20 ammocoetes per m^2 (average = 5.2 per m^2).

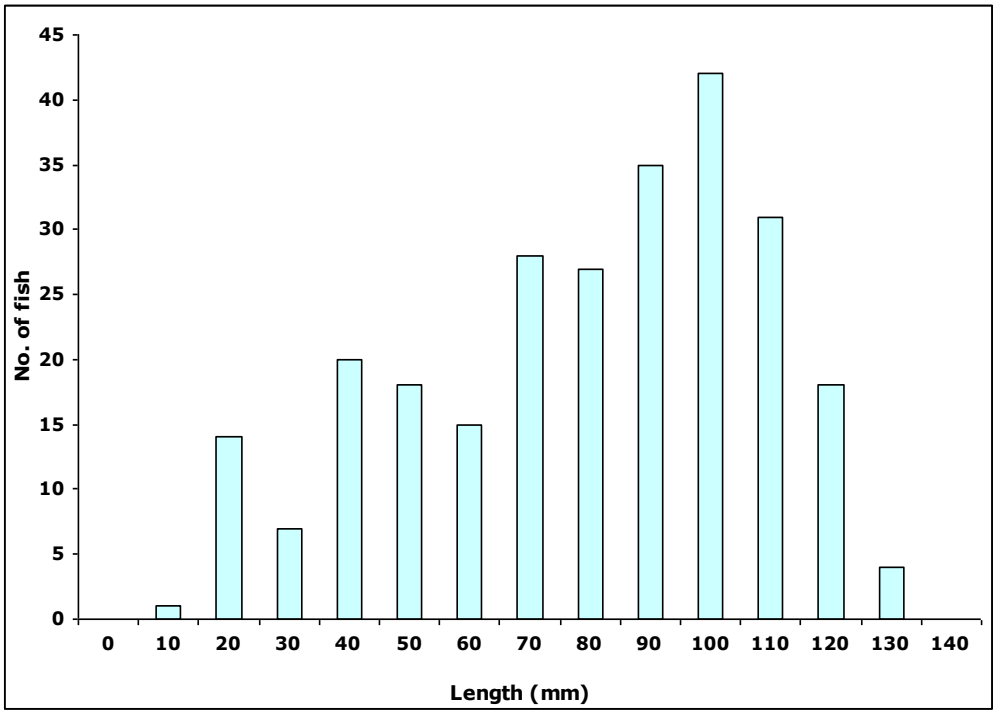

Figure 2.16. Length-frequency of juvenile river/brook lamprey, pooled for locations across the River Lee catchment (n=260, no. of sites = 26).

2.2 Adult lamprey surveys:

This package undertakes work on adults of all three species of lamprey found in Ireland. The programme aims to compile baseline biology and ecology in regard to spawning migrations, times and locations of spawning and general habitat attributes of spawning sites. Spawning sites are particularly important and are likely to be used by adult lamprey in successive years. The river- and brook lamprey are indistinguishable as juveniles. For this reason, the location of spawning sites is particularly important in attempting to assess the conservation status of the river lamprey (Kelly and King 2001).

Brook lamprey:

Surveying of brook lamprey (*Lampetra planeri* Bloch) spawning activity continued within a number of Irish river catchments during 2011. Presence of adult fish, redd construction and spawning activity were noted. Additional data pertaining to spawning redd physical attributes and riverine conditions were also collected at selected sites. Presence of adult brook lamprey and spawning activity was observed in most of the catchments visited.

Surveying in the Liffey, Avoca, Bandon, Laune and small Donegal catchments in 2010, while extensive in visiting a number of tributaries in each catchment, focussed on locations where recent larval status surveys had pointed to recent levels of recruitment and, hence, likelihood of spawning activity in adjacent upstream areas. Spot checks were conducted in other locations, i.e. the River Nore at Inistioge, Duiske River at Graiguenamanagh, Derry River at Shillelagh and River Maigue at Adare. Brook lamprey spawning activity was observed in several small feeder streams to Lough

Conn, in the Moy catchment, and behaviour here was monitored over a number of consecutive days.

The monitoring of spawning activity was undertaken in the months of April and May when brook lamprey spawning was considered likely to occur (Kelly and King 2001; Maitland 2003). Enumeration of redds was done *via* walkover survey, moving in an upstream direction in circumstances of low water levels, high water clarity and dry, calm weather conditions. The data set formed the basis of a peer-reviewed journal article accepted for publication (Rooney *et al.* In Press) and this should form a valuable information baseline for any future Irish studies on this topic area.

River lamprey: No specific survey work was undertaken for river lamprey in 2011. No evidence of river lamprey spawning activity was recorded during brook lamprey spawning surveys.

Sea lamprey: There were two strands to the sea lamprey investigations in 2011 - radio telemetry studies and float-over surveys to assess sea lamprey spawning in selected channels.

2.2.1 Telemetry studies on sea lamprey

The sea lamprey (*Petromyzon marinus* L.) is one of the qualifying interests in the Lower River Shannon SAC. This species is seen spawning annually downstream of the first artificial barrier on the Mulkear River at Annacotty, Co. Limerick. A radio telemetry study, using externally-mounted tags, was continued in 2011 to examine the response of this species to, and its capacity to ascend, the three artificial barriers in the lower reaches of the Mulkear River. During May 2011, following lamprey-specific modifications to the first and third barriers, thirty-six adult sea lamprey were captured at the base of the former structure and tagged. River water temperatures at this time were lower (13^0C) when compared with corresponding temperatures during the previous year. As in 2010, batches of tagged fish were released upstream (n=16) and downstream (n=20) of the first barrier, respectively. For the latter group, localised movements were recorded up to but not across the first barrier. The second barrier was a sloped crump weir that accommodated sea lamprey passage. Of the fish released upstream, three ascended the modified third barrier and progressed further into the catchment, moving distances of 2.3, 4.5 and 8.0 river kilometres (rkm), respectively. A number of tagged fish were located at various locations over 2km in the lower-most section of the Mulkear River, downstream of the first barrier at Annacotty. None, however, were recorded as having dropped-back into the main Shannon, as was the case in 2010 when tagged sea lamprey were located at spawning locations at Castleconnell and Plassey. Tag loss was, yet again, a significant factor downstream of the two main weirs in 2011.

2.2.2 Float-over surveys to identify locations of spawning and spawning effort

Three sea lamprey SAC channels were examined in 2011, using the float-over technique used in 2010 (see 2010 Annual Report) - the Barrow, Laune and Moy.

The River Barrow

An adult sea lamprey survey was undertaken on the River Barrow from Goresbridge to St. Mullins, by boat, between 12th and the 14th July 2011 during low flow conditions. The River Barrow is a navigable waterway between Athy and St. Mullins, with a twenty three locks and weirs present. In the section surveyed there are 10 locks and associated weirs present. These weirs and locks pose an obstacle in the upward migration of sea lamprey and the other lamprey species. A sea lamprey was captured during a Water Framework Directive survey of the River Barrow at Graiguenamanagh in 2010 which is located four locks upstream of St. Mullins, indicating the ability of sea lamprey to navigate the weirs.

Figure 2.17. Weirs on the River Barrow, Clashganna (left) and St. Mullins (right).

Due to the navigation on the River Barrow it is a very deep river. Sea lamprey favour well aerated gravels in which to spawn and excavate redds. The only areas liable to have such features present were downstream of weirs. These areas were examined and at the majority locations water was deemed too fast flowing to provide for suitable spawning habitat. Upstream of the weir in Graiguenamanagh there was an area of suitable sea lamprey spawning habitat, however, no redds were identified. Only one redd was identified in an area of suitable habitat downstream of the weir at St. Mullins. When compared to 2010, approximately ten redds were present, reflecting a poor number of sea lamprey spawning on the River Barrow in 2011.

Laune catchment sea lamprey redd survey

Surveying for evidence of recent sea and river lamprey spawning activity within sections of the Laune catchment was undertaken over three days in Summer 2011. Float over surveying commenced on July 13th, starting at the lower stretches of the Gearhameen River as it enters the Upper Lake at Lord Brandon's Cottage from the Black Valley on the north-western shore, and proceeding downstream through the upper sections of the Killarney Lakes complex, a distance of

10km by water (Figure 2.18). NPWS ranger staff had previously noted sea lamprey spawning at the former location, where long stretches of riffle-glide habitat are interspersed with deep pools. One single redd structure was noted at this location during 2011.

Figure 2.18. Mouth of Gearhameen River, Lord Brandon's Cottage, Upper Lake (left) and Galway's River (right).

Galway's River enters the southern shore of the Upper Lake, directly across from the Gearhameen River inflow. Presence of short sections of suitable spawning habitat were noted in the lower section of this river, however, no redd excavation was evident at this location (Figure 2.18).

Two further short sections of suitable habitat were identified between the Upper Lake and Lough Leane, at Dinish and at Brickeen Bridge, respectively (Figure 2.19). At both of these locations the channel constricts significantly and fast-flowing conditions over suitable spawning substrate occur. Anecdotal evidence suggests that both locations were used in the past by spawning sea lamprey.

Figure 2.19. Brickeen Bridge (left) and River Laune exiting Lough Leane (right).

Surveying continued along the River Laune from Lough Leane to the upper tidal limits in Killorglin town, a distance of 18km by water. This lower section contains numerous stretches of suitable habitat, especially at the outflow from Lough Leane, Beaufort Bridge, Ballymalis Castle (where a sea lamprey ammocoete was identified during catchment wide juvenile lamprey surveying in 2010), Dungeel and immediately upstream of the tidal limits in Killorglin. Despite the availability of suitable habitat, recent excavation was noted at the latter site only and comprised a single sea lamprey redd. Possible structures were encountered at two other locations. They could not, however, be definitively attributed to sea lamprey.

Moy catchment sea lamprey redd survey

Survey work was undertaken over three days (2nd - 4th August) working with Staff of IFI Ballina. A two-day float-over survey was undertaken on the main stem Moy from a fording point east of Aclare down to Ballylahan Bridge on the Foxford - Castlebar road. The total river distance was 31 km. In addition, a series of locations adjacent to bridges was examined on the Moy upstream to Cloonacool and on the River Deel in areas both up- and downstream of Crossmolina.

There was a marked absence of suitable characteristic sea lamprey spawning habitat in all areas examined. Suitable habitat consists of extended areas of gravels and small cobble, of similar size to those used by Atlantic salmon, with a relatively good gradient and a range of velocities. The main stem Moy had large areas of broken bedrock or deep uniform glides of clay and sand-clay.

A single sea lamprey redd was recorded adjacent to the upstream point of survey and redd dimensions and bed material sample collected. An extensive gravelled area at the confluence with the River Gweestion had potential for sea lamprey spawning, as had an area at the confluence with the River Spaddagh, downstream of Swinford. This latter area was subject to machinery activity at time of survey due to modification being made to a fish pass at the mouth of the Spaddagh.

There was a dearth of suitable habitat at sites examined in the River Deel, although sea lamprey have been recorded here in the past.

Any further sampling in this system might focus on the principal salmon spawning locations on the main Moy, as identified by IFI Ballina staff. The results are of concern, given the SAC status of the Moy catchment for sea lamprey. Individual sea lamprey adults were found in successive years in 2006 and 2007 during fisheries surveys in the lower reaches of the Eignagh River, downstream of Aclare village. It is possible that adult sea lamprey ascend and spawn in tributary channels, particularly given the lack of suitable spawning substratum in the main stem Moy. Elucidating spawning sites will be more difficult if this is the case.

2.3 Non-migratory adult lamprey:

The circulation of information on land-locked or non-migratory lamprey to IFI colleagues and the general public has led to information and records - photo images or bodies - from a number of waters. Indications of presence of non-migratory sea lamprey came from L. Derg, via IFI

colleagues and via the L. Derg Native Fish Biodiversity group. Individual specimens came from L. Corrib, where an initial specimen was recorded in 2010, from L. Conn and from Muckross Lake in Killarney. The Muckross Lake sample was inadvertently presented by a long-distance swimmer taking part in an organised long-distance swim (Figure 2.19). Photo evidence of lamprey and of attachment marks from L. Gill, in Sligo was kindly provided by Mr. Brian Conneely, Sligo Anglers Association.

In the majority of cases, the lamprey were captured during the mayfly season when a high level of angling activity occurred on these lakes.

Figure 2.19. Non-migratory lamprey found attached to swimmer, Muckross Lake, Killarney, July 2011.

These non-migratory lamprey are of considerable interest and tissue samples have been retained to permit genetic comparisons between these fish and the larger anadromous sea lamprey using the same waters. Initial genetic investigations are scheduled to be undertaken by colleagues in the US Forest and Wildlife Service.

Figure 2.20. Lamprey attachment mark on brown trout, L. Gill, May 2011 (Courtesy Mr. Brian Conneely, Sligo Anglers Association)

3. Shad Programme

There are three principal components to this programme – one each for adult and juvenile anadromous shad (Figure 3.1) and one for the land-locked Killarney shad. These programmes are largely confined to the Special Areas of Conservation (SACs) designated in respect of shad – the Slaney, Barrow-Nore, Suir and Munster Blackwater for anadromous shad (King and Roche 2008) and Lough Leane for the Killarney shad.

3.1 Adult anadromous shad surveys:

This strand focused on using angling as a sampling technique and effort was concentrated in the Munster Blackwater upriver of Cappoquin and in the Suir at Carrick-on-Suir.

Three sampling events took place on each river, working with Angling Advisors from IFI's Business Development Unit and with Mr. Terry Jackson, an experienced shad angler and angling journalist. The initial sampling effort in early May was unsuccessful, possibly due to wet and cold conditions. However, sampling in mid May and early June met with considerable success.

Figure 3.1. Terry Jackson and Mark Corps with shad caught by rod and line in Carrick-on-Suir.

Sampling effort on the Blackwater was facilitated by members of the Cappoquin Salmon and Trout Anglers Association who gave pointers to suitable angling ground and resting pool areas. Angling effort was focused at sunrise - early morning and on dusk fishing, a sample of 30 shads was collected over the total sampling period.

Advice from local IFI staff and from local fishing tackle proprietor was availed of at Carrick-on-Suir. Angling effort took place in the upper tidal waters in the area of the weir at Old Bridge in the town and also upstream of the town below the 'Miloko' factory. Only one of the sampling events yielded success, on a bright sunny afternoon.

The size range of shad captured was broadly similar at the two rivers and mirrored the size range of angling caught shad from St. Mullins on the River Barrow (Figure 3.2). Sample size was small at the Suir site relative to the other two rivers.

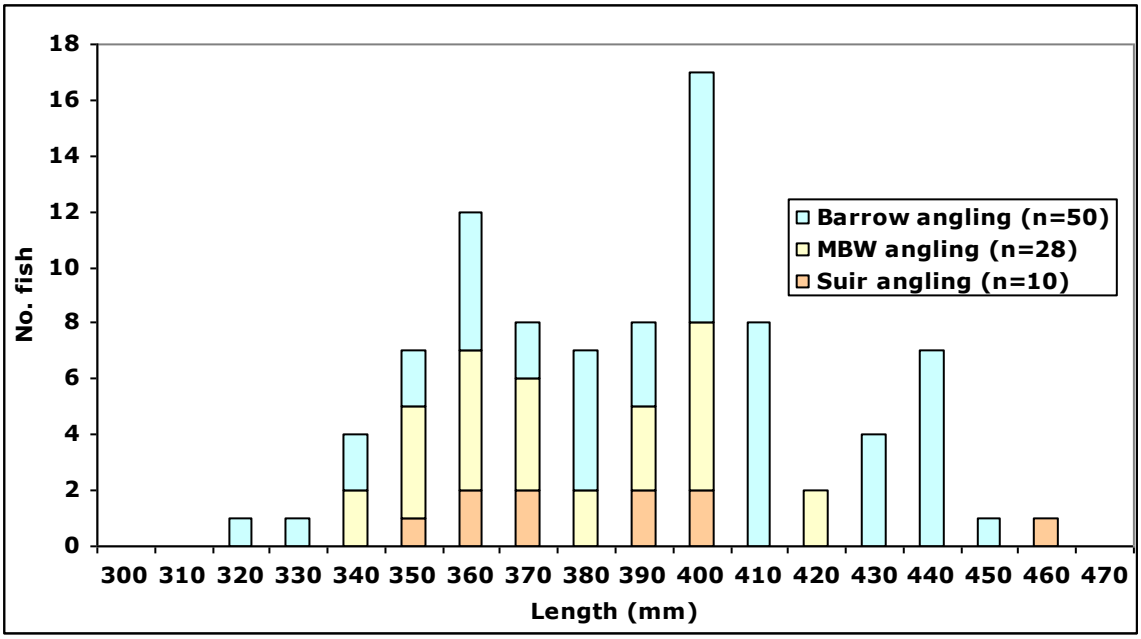

Figure 3.2. Length frequency of shad captured on the Rivers Barrow, Suir and Blackwater during May/June 2011.

3.2 Juvenile shad surveys:

Trials using a bongo-net set-up (Figure 3.3), undertaken in June 2010, were followed up in 2011 on the River Barrow downstream of St. Mullins. Sampling was undertaken in both June and July at a series of linear transects across a range of sites along the Barrow estuary. The open mouths of the nets (50 cm diameter) are set to face the direction of flow and the equipment can fish passively, by holding station with the boat's engine, or can be fished actively by driving slowly into the flow. Start and finish points were recorded using GPS and water velocity was recorded using a flow meter. Planktonic material, including fish eggs, larvae and juvenile fish collect in the cod-end of each net.

Figure 3.3. Bongo net and IFI boat crew, St. Mullins, June 2010.

Transits of 15 minute duration were undertaken and material collected was rinsed through a fine-mesh sieve (Figure 3.4), debris removed and any biotic material stored in alcohol for later examination. Results are converted to standardized units of no. organisms / m^3 of water filtered (after Navodaru 2001).

Figure 3.4. Juvenile fish captured during a bongo netting survey.

The sampling indicated the presence of juvenile shad, juvenile smelt and gobies. The shad were identified on the basis of fin ray counts on the dorsal and anal fins. The sampling confirmed that successful spawning had occurred. It provided information on size range and growth rate of the

young shad (Figure 3.5), on post-larval density and on rate of dispersal of the young fish down the Barrow estuary (Figure 3.6).

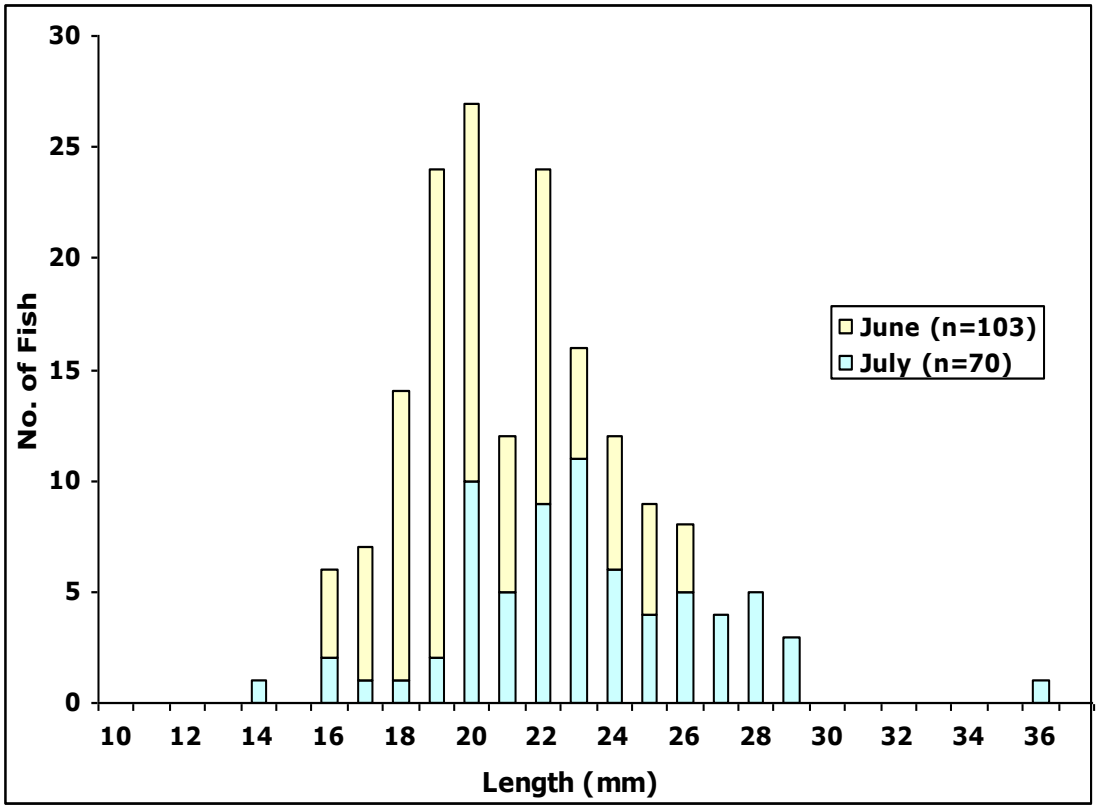

Figure 3.5. Length frequency of juvenile shad caught on the River Barrow.

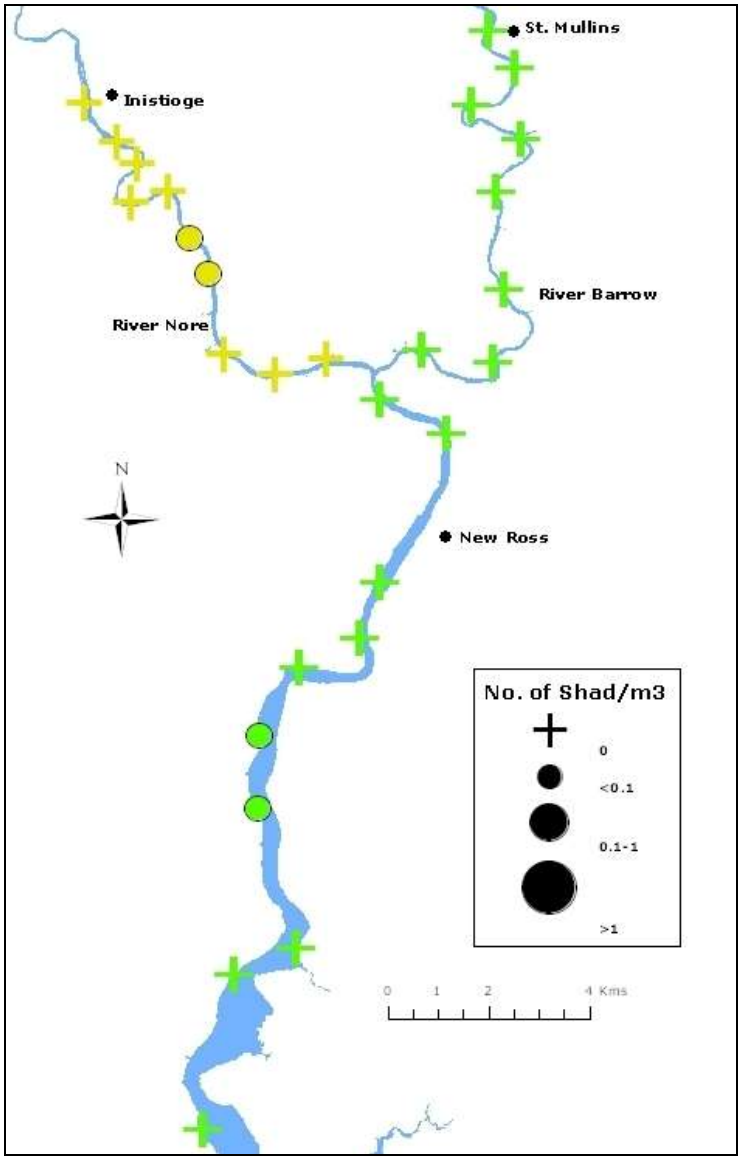

Figure 3.6. Distribution of juvenile Shad on the Rivers Barrow and Nore during July 2011.

3.3 Killarney Shad

Surveying for Killarney Shad commenced on June 29th. Four survey nets (two lake gill nets and two monofilament nets) were set at three locations in Castlelough Bay and at one location in Victoria Bay, respectively. Nets were allowed to fish overnight and were recovered the following morning. Perch (n = 101, length range 10 - 26cm) dominated the catch overall, followed by brown trout (n=47, 14 – 44cm), flounder (n=23, 19 – 30cm), sea trout (n=4, 50 – 55cm), eel (n=2, 41 – 52cm) and salmon (n=1, 57cm). Killarney Shad, the target species, numbered 11 individuals; seven from Castlelough Bay and four from Victoria Bay. Lengths could only be obtained from two fish (both 18cm) due to eel predation.

Surveying continued on July 12th with a pair of monofilament nets deployed at separate locations in Castlelough Bay. To limit potential predation damage to captured Killarney Shad, nets were set in the early evening and recovered before midnight. Each of the nets was empty when lifted. Both

nets were re-deployed the following evening; the first in Castlelough Bay and the second, following local angler advice, in a deep (30m) section of the lake along the Tomies shore. This latter net captured a single perch. The former net, however, provided 11 perch, 4 brown trout and 2 Killarney shad. The two monofilament nets were reset for 3 hours at two locations in Castlelough Bay on the evening of July 26th. No further specimens of Killarney shad were captured on this occasion.

Bongo net surveying for juvenile Killarney shad

Bongo-net surveying was undertaken during mid-August 2011 on Lough Leane to encounter young of the year Killarney Shad. Straight-line trawls, varying in duration from 10 to 17 minutes, were undertaken at five separate locations in Castlelough Bay. No juvenile Killarney shad were encountered.

4. Pollan Programme in 2011

4.1 Background to current pollan investigations

Pollan are found in a small number of large lakes in Ireland and are considered a glacial relict form. They are known from Lough Derg and Lough Ree on the Shannon as well as Lough Neagh and Lower Lough Erne in Northern Ireland. More recently, they have been found in Lough Allen (Harrison et al 2010) on the Shannon (Figure 4.1).

Figure 4.1. Locations of pollan lakes in Ireland.

The pollan is one of Ireland's most endangered species (King *et al.* 2011). The survey team linked in with the Water Framework Directive (WFD) fish survey team of IFI in both 2009 (Lough Derg) and 2010 (Lough Ree) in undertaking fish surveys that included both conventional netting and remote sensing with hydroacoustics. Weather conditions during the Lough Ree survey were very suitable for deployment of hydroacoustic gear and a series of 'clouds', consistent with occurrence of pollan, were identified. Ground truthing confirmed the presence of pollan in shoal patterns and a

number of pollan, of varying sizes, were taken in the overall survey. Analysis of the hydroacoustic patterns indicated a modest population of pollan in Lough Ree. However, it is considered premature to think that the Lough Ree population is at good conservation status (Harrison *et al.* 2012).

Of importance to this project is the elucidation of the pollan spawning areas within each lake and the potential to capture spawning fish for captive breeding. The rationale here relates to the conservation of the actual spawning grounds and also the potential to use fish husbandry to generate a 'reservoir' population of pollan for each of the large lakes in which there are resident populations. The 'reservoir' approach would also involve finding an ecologically suitable lake into which the husbandry-reared population of pollan could be introduced.

A programme of fyke netting in the winter of 2009 - 2010 on Lough Derg failed to find any spawning pollan. A similar programme was planned for Lough Ree in Winter 2011 - 2012. In an attempt to have greater success than in Lough Derg, a reconnaissance survey to identify potential target netting locations for spawning fish was planned and undertaken in Summer 2011 prior to any winter netting.

4.2 Lough Ree Pollan - identification of potential spawning habitats

During August 2011, low water levels and favourable weather conditions on Lough Ree allowed surveying and identification of potential pollan spawning locations. Over three days (23rd to 25th) a number of exposed headlands, shorelines, islands and submerged gravel shoals were investigated in the lower two-thirds of the lake (Figure 4.2). Of interest was the aspect, degree of exposure, depth and substrate composition at the various sites. Potentially suitable locations would become the foci of targeted netting during the winter spawning period for the purposes of brood stock collection for husbandry.

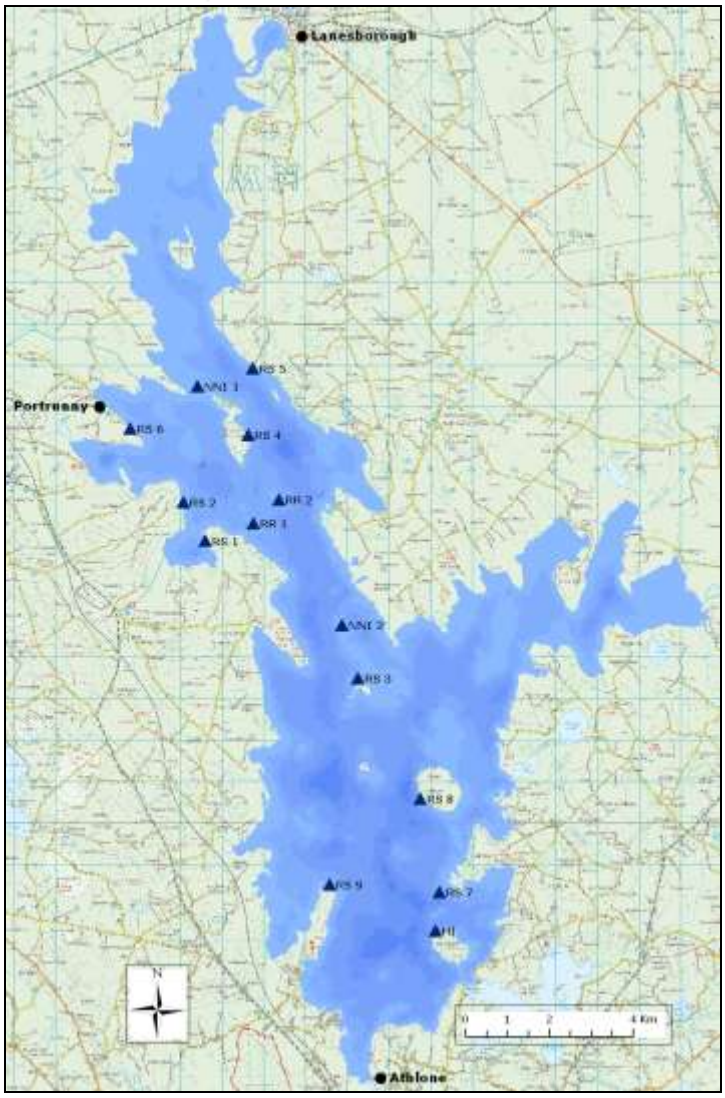

Figure 4.2. Map indicating locations of possible spawning areas on Lough Ree.

Shorelines- A number of mainland shorelines were investigated, chiefly on the western (Roscommon) side of the lake. Blackbrink Bay, close to Lecarrow (Figure 4.2, RS 1) contains a suitable stretch of west-facing shore. Also present at the margins of this bay are some small headlands exposed to east and north winds. Northwards from this point, the east facing shore between Blackbrink Bay and Galey Bay (Figure 4.2, RS 2, also Figure 4.3) comprises some suitable spawning substrate. It is, however, rather sheltered and is perhaps not exposed enough to attract pollan. Further north from this location is Portrunny (Figure 4.2, RS 6, also Figure 4.3), facing in an east/north-east aspect and comprising large cobbles and rocks with a lack of fine gravels.

Figure 4.3. Shoreline between Blackbrink Bay and Galey Bay (left) and Shoreline at Portrunny (right).

At the south-western end of the lake, immediately north of Hodson Bay, is Yew Point (Figure 4.2, RS 9, also Figure 4.4) where a wave-swept shingle spit extends north-eastwards from the tip of the promontory immediately west of red navigation marker #1. This promontory is completely exposed and comprises potentially excellent pollan spawning habitat.

Figure 4.4. Yew Point (left and right).

Islands - Quaker Island or 'Inchcleraun' is a large island situated in the upper section of Lough Ree off Portrunny. It is, in turn, surrounded by a number of smaller islands and rocky shoals. To the west of Quaker Island is Dog's Island, a small islet, the shores of which are a mixture of boulders, cobbles and finer gravels (Figure 4.5). Banks of shingle and zebra mussel shells are heaped on all sides and it is exposed in all directions. Finer sediments on the south-eastern corner of the island would perhaps provide spawning substrate for pollan.

North of Quaker (Inchcleraun) Island is an unnamed island (Figure 4.2, NNI 1). Whilst the western shore is exposed, the substrate may be too-large (Figure 4.5). Closer to the mainland, Sedgy or 'Hag's' Island also appears unsuitable as potential spawning habitat.

Figure 4.5. Shoreline habitat on island north of Quaker Island (left) and Western shoreline of Quaker Island (right).

Quaker Island itself has a number of exposed shores. The south-east shore (Figure 4.2, RS 4), characterised by large, algal-covered rocks, was deemed largely unsuitable. Two bays south-east of this point comprise slightly better habitat, with anecdotal evidence of pollan shoaling in late November (John Finn, pers. comm.). The north-eastern shore of Quaker Island (Figure 4.2, RS 5) is extremely exposed with a substrate composed mainly of large stones and rocks. Midway along the opposing western shore of Quaker Island a similar section of semi-suitable spawning habitat is located. Between Quaker Island and the eastern mainland is Priest Island, the shores of which are quite rocky.

The Black Islands are a collection of some ten small islands in the centre of Lough Ree (Figure 4.6). The largest of these, King's Island, has a west facing shore with a good mix of gravels (Figure 4.2, RS 3). The eastern shore comprises a finer mixture of gravels, often quite sandy in places. The most northerly of the Black Islands (Figure 4.2, NNI 2) has very suitable spawning habitat on its north-eastern corner.

Figure 4.6. Potential spawning habitat amongst Black Islands (left and right).

A number of large islands in the south-eastern portion of Lough Ree were investigated for suitability. Inchmore, the largest island in the lower lake, has potential spawning habitat along its south / south-western / western shoreline (Figure 4.2, RS 8). Further south Hare Island (Figure 4.2, HI) has no suitable habitat along its shores.

Fat Head Island is located between Hare Island and Inchmore in a shallow section of the lake (Figure 4.7). This small island has suitable fine gravels on its north-eastern corner (Figure 4.2, RS 7) and in places along its west-facing shore also.

Figure 4.7. Spawning habitat at Fat Head Island (left) and Iskeraulin Shoal (right).

Gravel and Rock Shoals - Lough Ree contains numerous gravel and rock shoals forming shallow patches, often exposed during summer months. These shoals are well-flagged by navigation markers for avoidance by boat traffic. Two of these, Wood Shoal and Iskeraulin Shoal (Figure 4.7), located immediately south of Quaker Island, were investigated and were deemed potentially suitable. Both were exposed by low water conditions at this time. The former, Wood Shoal, immediately west of red navigation marker #6, comprises small stones & gravels (Figure 4.2, RR 1). The latter, Iskeraulin Shoal, located east of red marker #6 and a pair of black markers, provides similar habitat (Figure 4.2, RR 2).

4.3 Spawning Adult Surveys, Winter 2011-2012:

Persistent windy conditions on Lough Ree from late-November 2011 to mid-January 2012 precluded or curtailed numerous attempts to locate and acquire spawning adult pollan. Nets were set overnight on three occasions; 20th December 2011 and 10th – 11th January 2012 (Figure 4.8). On the first occasion, fyke-netting was concentrated in the lower sections of the lake along the mainland shoreline at Yew Point and around Fat Head Island. On the second occasion, nets were set at various locations around Quaker Island and Dog's Island. On the third occasion, netting concentrated on the gravel shallows at Wood Shoal and Iskeraulin Shoal, as well along western mainland shorelines at Blackbrink Bay, Galey Bay and Portrunny. Windy conditions precluded netting at locations around the Black Islands and Inchmore. No pollan were encountered.

5. Smelt Programme in 2011

The smelt has a curiously dispersed distribution on the island of Ireland, being represented by populations in the Foyle, the Shannon and in the large estuaries of the southeast (Figure 5.1). It is of importance for smelt conservation to determine if populations in a waterbody are spawning, rather than merely visitors, and if so, what the level of recruitment is.

Arising from data collected over recent years by IFI and by colleague agencies in Northern Ireland, the threat status to the smelt has been reduced in the recently-published Red Data Book on fish, amphibians and reptiles (King *et al.* 2011).

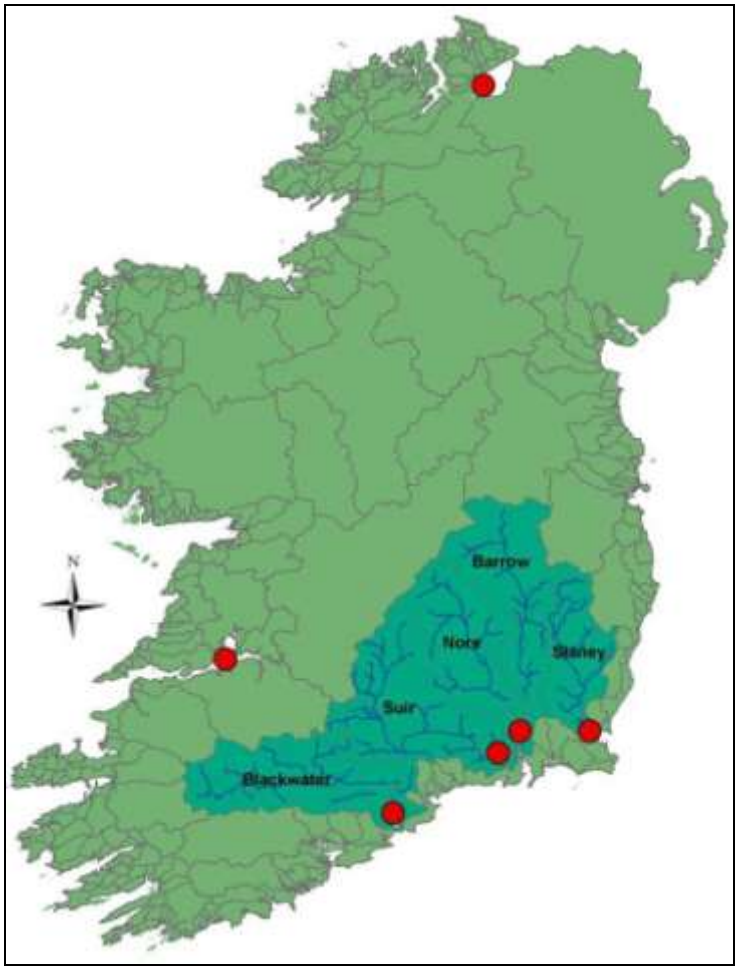

Figure 5.1. Map of Ireland indicating locations of smelt populations.

5.1 Adult Smelt programme

Smelt netting surveys - Surveying for spawning smelt was undertaken on the River Slaney during March 2011. A total of eight gangs of fyke nets were set (22/03/2011), left overnight and lifted the following day (23/03/2011). Surveying was concentrated in the upper tidal section of the River Slaney with three gangs of nets set at King's Island and at Edermine (Figure 5.2), respectively. Netting effort was also directed towards the extreme upper tidal limits in Enniscorthy town with two gangs of fykes set upstream of the railway bridge. During their period of deployment the survey nets experienced two consecutive high tides at 9pm and 9:20am, respectively. No smelt were encountered in any of the survey nets on this occasion.

Figure 5.2. The R. Slaney at Edermine, Co. Wexford.

Smelt Egg Deposition - During late March and early April 2011 the upper tidal sections of a number of rivers were searched for signs of smelt egg deposition following possible spawning. It was anticipated that underwater searches during low tide conditions in rocky or gravelled areas using an aquascope would reveal smelt eggs adhered to surfaces. Inspection of suitable habitats on the River Barrow at St. Mullins, Co. Carlow and the River Nore at Inistioge, Co. Kilkenny were inconclusive. Similar surveying, in conjunction with Loughs Agency staff, on the Rivers Finn, Deele and Mourne in Countys Donegal and Tyrone were also unsuccessful. Positive results were, however, obtained from the River Shannon in the vicinity of Sarsfield Bridge and Clancy Strand in Limerick City. In order to provide a measure of density, numbers of eggs were counted on rock and boulder faces and the area of each surface calculated. Numbers of eggs observed at 10 separate locations ranged from 2 to 20, with respective densities of 33 to 667 eggs per m^2. Water temperatures in this section of the Shannon rose steadily from 7°C in mid-March to 10°C at the beginning of April.

Figure 5.3. Searching for smelt eggs using an aquascope on the River Finn at Castlefinn, Co. Donegal (left) and confirmed smelt spawning location at Clancy Strand, Limerick City. Note aquascope in foreground (right).

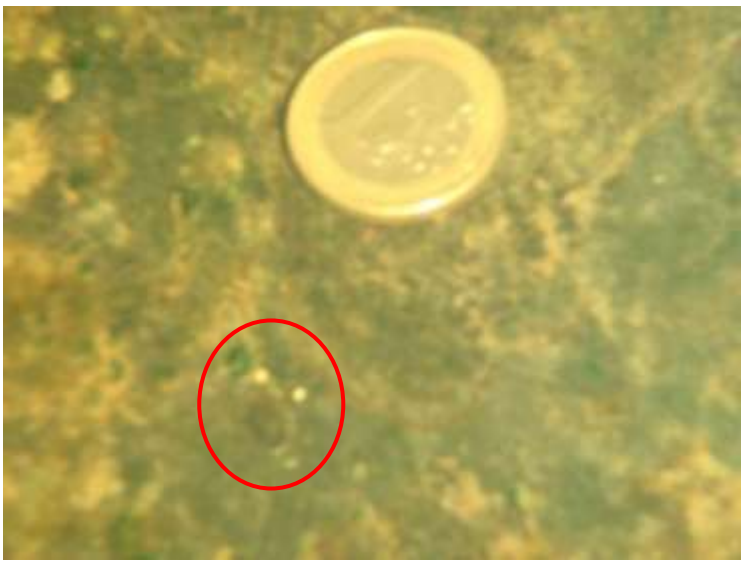

Figure 5.4. Smelt eggs adhered to underwater rock face with €1 coin for scale.

5.2 Juvenile Smelt programme

Monitoring for smelt during 2011 was undertaken for the juvenile phase of the life cycle. Fish were captured using bongo netting, a technique used to monitor juvenile fish (see Section 3.2 above). Synergies were incorporated into the programme in that it was possible to monitor for both juvenile shad and smelt during the same survey, thus reducing resources required to undertake surveys. During 2011, the River Barrow was sampled in June and July while the Rivers Nore, Suir and Munster Blackwater were sampled in July.

The bongo net is suspended from the bow of the boat and can be set to fish at a specific depth in the water column. The bongo net was generally deployed for fifteen minutes at a time. Water velocity was measured using a flow meter (Model 801 Electromagnetic Open Channel Flow Meter,

Valeport Ltd., Devon, U.K.). Sites were georeferenced (Garmin GPS) at the start and endpoint of each trawl. The lengths of the trawls, calculated from a GIS layer (ArcGIS 9.3, ESRI, Redlands, CA., U.S.A.) when multiplied by net diameter yielded an estimate of volume of water filtered (cubic metres). Data were compiled as number of fish per cubic metre of water filtered, allowing comparison between different hauls and between different water bodies (Figures 5.5 and 5 6).

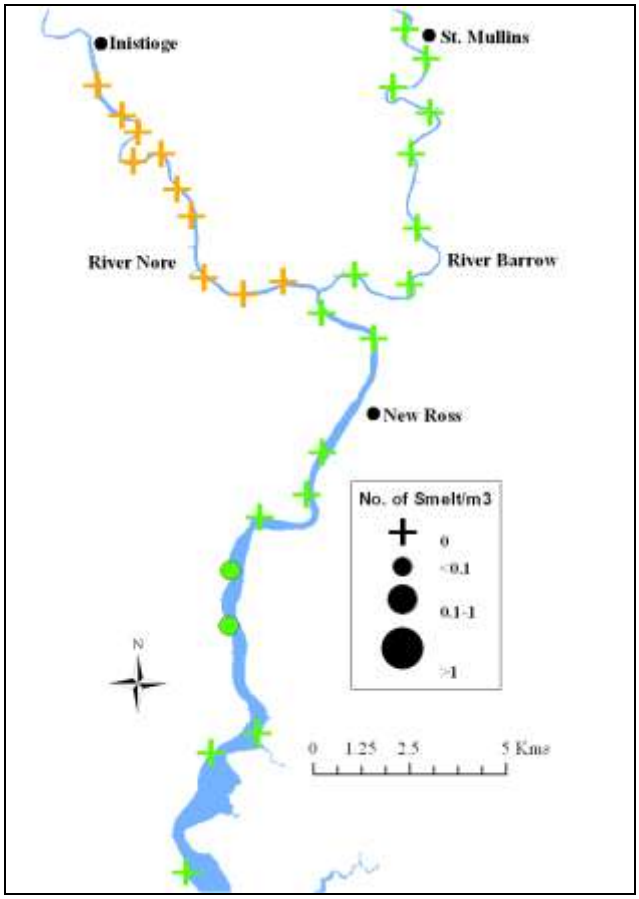

Figure 5.5. Density and distribution of juvenile smelt on the Rivers Barrow and Nore during July 2011.

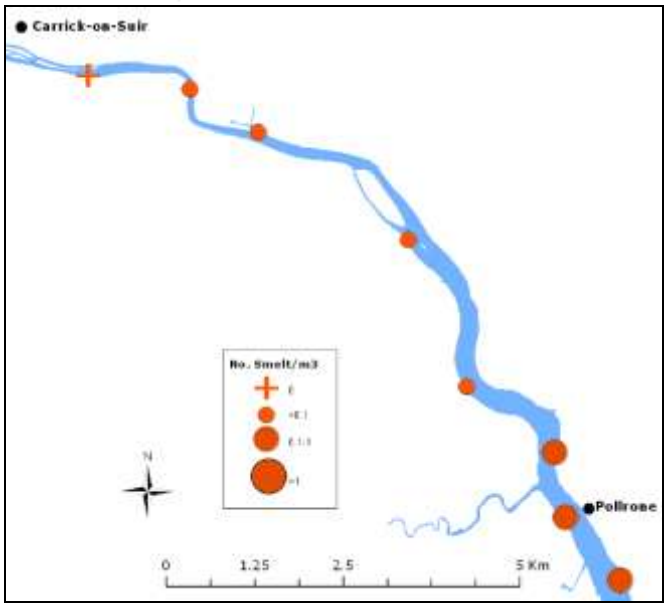

Figure 5.6. Density and distribution of juvenile smelt on the River Suir during July 2011.

Smelt were present in samples collected from the Rivers Barrow and Suir. No juvenile smelt were recorded on the Rivers Nore or Munster Blackwater. The Suir samples were taken at most stations in the upper reaches of the Suir. This contrasted with the Nore where smelt were taken at two stations, only, and in the lower reaches of the Barrow (Figures 5.5 and 5.6).

Samples were retained and returned to the IFI laboratory for identification and further analysis (Figure 5.7).

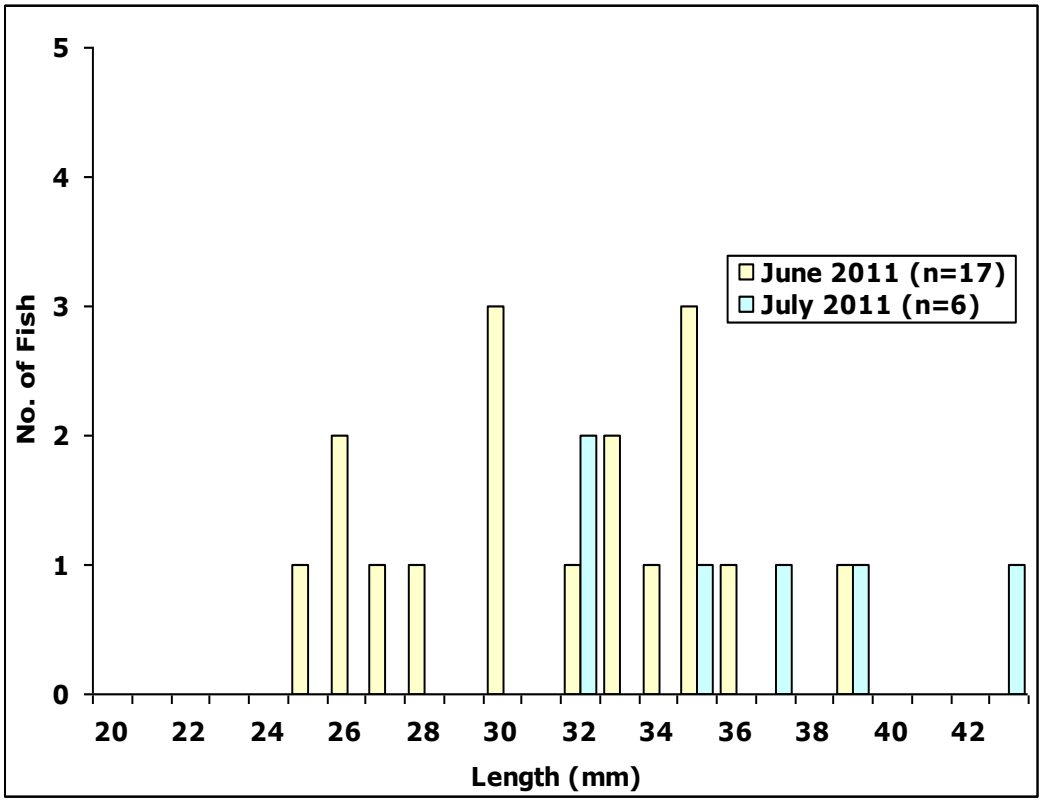

Figure 5.7. Length-frequency of juvenile smelt captured on the River Barrow during June and July 2011.

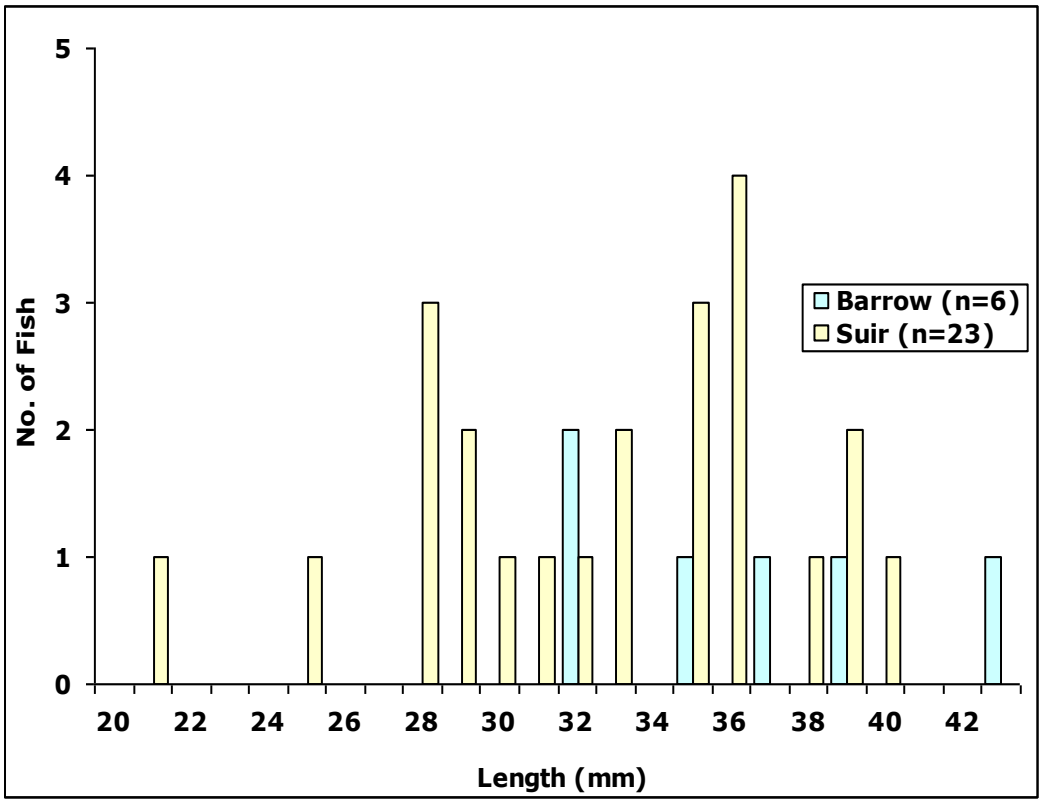

Figure 5.8. Length-frequency of juvenile smelt captured on the Rivers Barrow and Suir during July 2011.

Length frequency analysis of the fish captured on both rivers indicated a large variation in sizes of individuals recorded. Sampling on the River Barrow in June yielded 17 individuals, ranging from 25 to 39 mm in length. The same survey undertaken in July only yielded six individuals. These fish were all larger, 35 - 43 mm, indicating a degree of growth, as would be expected given the later sampling period. In total twenty three fish were captured on the River Suir in July. These ranged in size from 21 mm to 40 mm, spanning the combined size range of the June and July samples from the Barrow. Larger sample sizes would be required to obtain a clearer picture of the size range and growth rates for individual waters and permit better comparison between waters.

It is proposed to continue with this method on an annual basis in order to ascertain the density, distribution and location of juvenile shad and smelt across the large southern estuaries.

6. Char Programme

Arctic char (*Salvelinus alpinus*) is considered to have a vulnerable status according to the most recent Irish Red List for Amphibians, Reptiles & Freshwater Fish (King *et al*. 2011). Arctic char have a circumpolar distribution and many landlocked populations occur in the Northern hemisphere at higher altitudes. There are two sub-groups of char, a sea-run and a freshwater landlocked group. In Ireland all populations are within the freshwater group.

In 2011 two lakes were identified for survey as possible locations for char populations. These were Lough Oorid in west Galway and Lough Nanuarragh in Donegal.

Table 6.1. Summary information char lakes surveyed.

Lake Name	Date	Water Body code	Area (ha)	Maximum depth (m)
NWRBD				
Nanuarragh	Sept. 2011	NW_38_8	13.8	14.3
WRBD				
Oorid	Oct. 2011	WE_32_196	60.5	54.7

Prior to undertaking a fish population survey of a lake the bathymetry of the lake must be determined. The bathymetry of Lough Oorid was undertaken by locally-based staff. In the case of Lough Nanuarragh, the Habitats Directive team undertook the survey in conjunction with locally-based staff. The data on depths and locations collected were fed into ArcMap software that generated depth contour lines georeferenced locations where nets were to be set.

Based on the area of the lake and the maximum depth, the number of nets which were required was ascertained. These were set within specific depth zones. Floating nets were also used over the deepest areas of the lake and fyke nets were used in order to capture the benthic fish such as eels.

Accessibility to Lough Nanuarragh was very limited. The survey was due to have been undertaken in 2010 but was cancelled due to bad weather. Based on the size and depth of the lake eight benthic nets, two floating nets and two gangs of fyke nets were to be used. As a result of this it was decided not to undertake a full survey but to determine the presence or absence of arctic char using a smaller number of nets (Figure 6.1).

The survey of Lough Oorid was hindered due to bad weather. Nets were set on one half of the lake but due to high winds could not be retrieved for three days. The lake was surveyed late in the sampling season and so it was deemed too close to the spawning time to continue the survey.

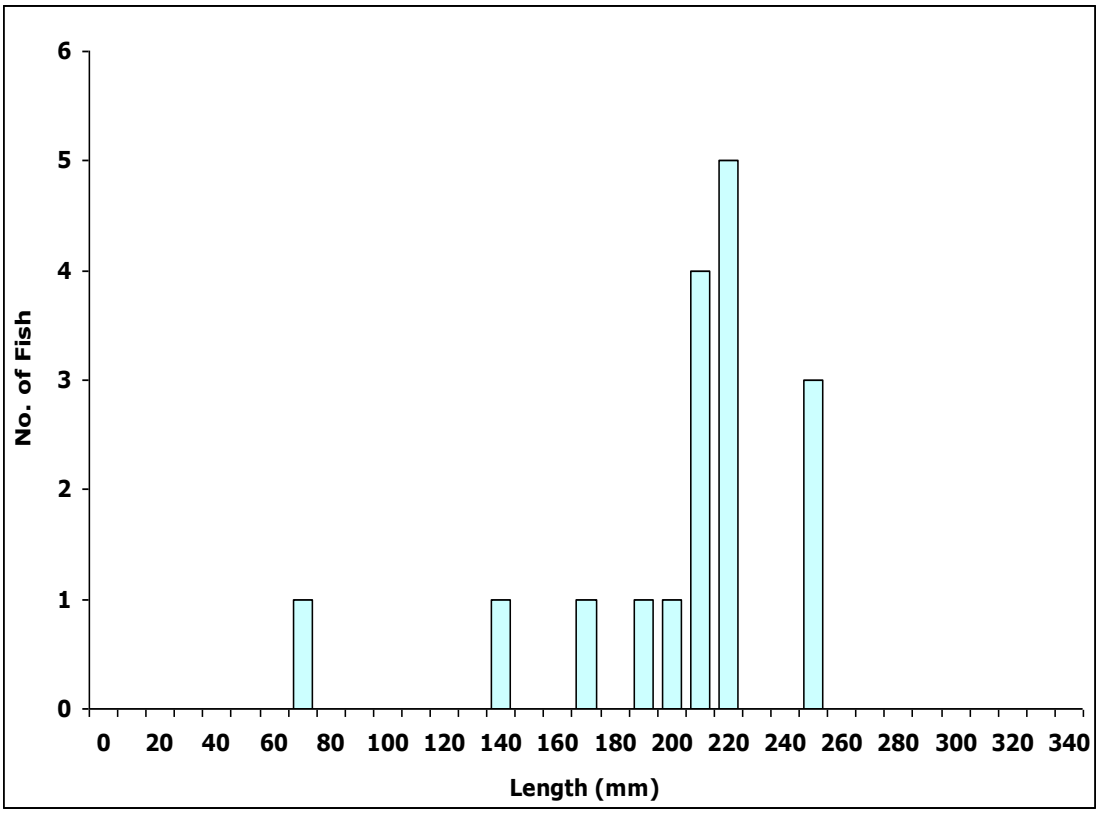

Figure 6.1. Length Frequency of brown trout on Lough Nanuarragh (n=17).

A small number of brown trout, ranging in size from 70 mm to 250 mm was captured in Lough Nanuarragh. No char were recorded. No other fish species were encountered. It is possible that eel are present but fyke nets were not set here, due to lack of accessibility.

A substantial number of brown trout was recorded in Lough Oorid. Fish ranged in size from 110 mm to 340 mm, representing a range of age classes, with a modal peak at 200 - 210 mm (Figure 6.2). Other fish species recorded included eel and 3-spined stickleback. No char were encountered.

The net sampling method used is the same as that used by the IFI Water Framework Directive (WFD) fish monitoring team. This permits a sharing and comparison of results. The adverse weather during the Lough Oorid survey is likely to have had an adverse impact on the sampling efficiency of the nets. The nets are set to fish overnight, with captured fish being removed next day and the nets reset elsewhere in the waterbody. In Lough Oorid, nets fished over three nights in the same locations, the adverse weather preventing staff from working on the lake. Thus, the sample of fish captured is likely to represent the size range and species composition of the fish community in the lake but it would be inappropriate to generate a CPUE (catch per unit effort) i.e. number of fish per net night, as nets were likely to be impacted by wave action and by vegetation being stirred about in the high wind and heavy wave conditions.

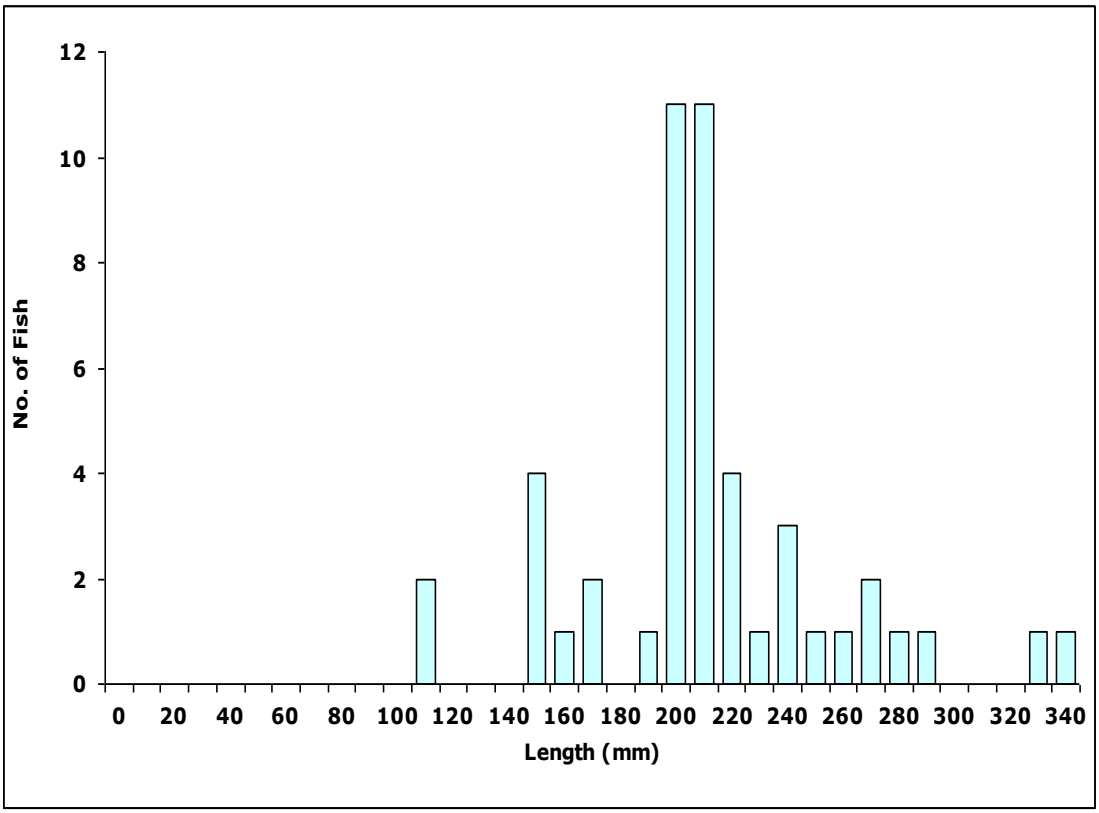

Figure 6.2. Length frequency of brown trout on Lough Oorid (n=48).

Figure 6.3. Lough Oorid.

7. Looking Forward

A range of sampling strategies has been employed to examine the status of different life stages of different species groups. Many of the strategies are 'traditional', such as angling, netting and use of electrical fishing. In turn, many of these are demanding on time and manpower. It will be imperative to avail of new technologies to provide more accurate answers in a more cost-effective way. Use of telemetry to follow migrating sea lamprey has its obvious attractions. However, outcomes from the shared work with Mulkear LIFE project has identified serious shortcomings with the approach. It is evident, however, that there is substantial scope for use of telemetry, provided that tags of appropriate size can be attached to the target species without adverse effect, that the tags remain attached over the duration of the experiment and that it is feasible to track or follow the movements of the marked fish. Already, a telemetry plan to follow the movements of spawning shad is being planned for Spring 2012 and other experiments to use this technology will follow.

Hydroacoustics has considerable potential to assess status of target species in a non-invasive way. This is particularly important when dealing with species having low population levels such as the pollan. Considerable time and effort was put in to pollan survey work in 2011 without any success. It is clear that the survey team must develop its own hydroacoustic expertise in order to conduct such surveys on the large Shannon lakes for pollan both in the summer condition and also at the pre-spawning stage in winter. A combined hydroacoustics - groundtruthing strategy has been developed by IFI's Water Framework Directive team, who have developed the design for a boat that can undertake hydroacoustics while being rigged with trawling technology that can be deployed if positive targets e.g. pollan, are detected in the hydroacoustic traces. This craft is currently being produced and it is hoped that joint trials can be undertaken in late 2012 or in 2013.

The 2011 trials using bongo netting have yielded some very encouraging results in regard to shad and smelt recruitment. Discussion with colleagues in AFBI (Northern Ireland) in regard to pollan sampling have identified that AFBI use a similar plankton sampling technique for post-larval and early juvenile pollan in Lough Neagh with very positive outcomes. This option was identified too late in spring 2012 for use in that season but it will be trialled in 2013, networking with colleagues from AFBI.

The programme in 2012 will continue to build on the growing information base on distribution, population structures and sizes of the target species. With the 2013 reporting deadline to the EU for status assessment of the Habitats Directive fish species, IFI will be focusing on generating status reports on the suite of Annex II and V fish species within our ambit. Simultaneously, NPWS is liaising with IFI in regard to setting conservation guidelines for the target species. In this regard, it is becoming increasingly evident that physical barriers to fish migration, both up- and downstream, are a major issue in relation to achieving good conservation status. This is particularly the case for the sea lamprey, populations of which continue to undertake spawning in

the lower reaches of SAC channels, frequently downstream of the first major barrier to upstream passage.

The new S.I. 477 of 2011 provides a legislative basis for IFI to introduce legal measures to protect the status of the various Habitats Directive fish species in its stewardship. These should complement existing fisheries legislation available to IFI. The legislation clearly identifies the fisheries Minister as having a role in the monitoring and surveillance of the fish species, a role that IFI actively undertakes on behalf of the Minister.

Project Personnel and Acknowledgements

The IFI Swords team involved in the Habitats Directive and Red Data Book fish investigations during 2011 comprised Dr. James King, Ms. Nicola O'Gorman and Dr. Sean Rooney.

In all waters surveyed, the team received full support from our colleagues within the individual IFI River Basin Districts (RBD) and thanks are due to the RBD Directors and their Inspectors, who organised logistics and support, and to officers within each area where surveys were undertaken.

Investigations on Lough Leane in Killarney National Park were undertaken with the assistance of Mr. Paidi O' Leary and his staff of National Parks and Wildlife Service. Information on non-migratory lamprey came from the Dundag Swimming Club, as in previous years, and from the Sligo Anglers Association.

Mr. John Finn joined the team on a short-term contract and participated in a range of programme activities, as well as carrying out the Owenmore-Unshin juvenile lamprey survey with locally-based colleagues from the Western RBD. Mr. Finn's knowledge of Lough Ree was most valuable in the pollan spawning habitat survey. Ms. Martina Woods also joined the team on a short-term contract and participated in the Lee catchment-wide juvenile lamprey and the Lough Oorid survey. Liam Murray completed the juvenile lamprey surveys on the Rivers Glyde and Dee in conjunction with his staff at IFI Creevey.

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