Habitats Directive and Red Data Book Fish Species

Executive Report 2009

Iascach Intíre Éireann
Inland Fisheries Ireland

National Programme: Habitats Directive and Red Data Book Fish species 2009

Executive Report

IFI Report Number: IFI/2010/1-0480

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1. Introduction

The requirement to monitor the status of fish species listed in the Habitats Directive and in the Irish implementing legislation has underpinned the necessity of this programme in 2009. The principal fish taxa requiring monitoring, under Annex II of the Habitats Directive and the Irish enabling legislation are:

- Atlantic salmon
- River, Brook and Sea lamprey
- Twaite shad and Killarney shad
- Pollan

This report deals with all species, apart from Atlantic salmon, listed in the Red Data Book of Whilde (1993). This term is an international one used to designate status of species – plant or animal – and to flag vulnerable or endangered organisms. With reference to the extant Irish Red Data Book for vertebrates, the fish species not listed in the Habitats Directive are the char and the smelt. It was considered appropriate to 'capture' these two species in this new programme of monitoring and investigation concentrating on 'conservation fish species'. The sampling necessary for smelt fits in as a subset of estuarine sampling, in terms of locations and time-of-year, for the shad and lamprey, thereby creating valuable synergy and value-for-money in survey terms. As each of the fish groups has quite distinct habitat and ecological requirements, the monitoring programmes for each group are quite distinct. Progress on developing sampling protocols and implementing monitoring for the various life stages identified for different taxa in 2009 is presented below.

The programmes involved extensive survey programmes. In all cases survey work was undertaken with staff of the various Regional Fisheries Boards. Excellent logistical and manpower support was afforded in all cases. In respect of juvenile lamprey surveying, training was provided to two small teams of officers in the Shannon and North-Western Regional Fisheries Boards. These officers then

undertook the ground surveys, compiling and logging data, in close liaison with an officer of the CFB Habitats Directive team. This strategy has also been used in the catchment-wide fishing programme for juvenile salmon and it is hoped to develop this further in 2010 for juvenile lamprey.

Close synergies were availed of, to provide cost-effective use of resources. The Water Framework Directive (WFD) Lakes monitoring team was scheduled to survey L. Derg on the Shannon during its 2009 programme. This is one of the target lakes for pollan status assessment under Habitats Directive and the Habitats Directive team was able to work with the WFD team. Similarly, information on distribution of species was available through the various WFD fish monitoring teams and from other CFB teams dedicated on specific projects. Autumn sampling for juvenile shad also yielded valuable information on smelt recruitment and population structure. The char sampling arose as a request from the Northern Regional Fisheries Board and the datasets obtained were consistent with Water Framework Directive monitoring requirements.

2. Lamprey Programme

2.1 Juvenile lamprey catchment-wide surveys:

Background - This package is operated on a catchment basis, with a focussed sampling effort in a predetermined number of sites spread along individual channels in a catchment, in habitat characteristic of juvenile lamprey. 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 channels. Survey work is undertaken during the period late August – late October. The model used in the catchment-wide fishing for juvenile salmon– with experienced RFB staff compiling the data locally, with technical/mentoring support from CFB staff - was trialled to considerable succession the Inny and Bonet systems.

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

The programme built on the network of catchments already examined and the catchments scheduled for 2009 were (Figure 2.2)

- Avoca (ERFB) 34 sites
- Inny (ShRFB) 67 sites
- Bandon (SWRFB) 35 sites
- Garavogue – Bonet (NWRFB) 24 sites
- Swilly and Leannan systems (NRFB) 37 sites

Excellent support was received from each of the five RFBs, in the context of current budgetary and staffing constraints. Rollout of this facet began in late August and was completed in mid – October.

The outcomes were quite different from one catchment to another (Table 2.1). There was a high degree of negative sites, those where no juvenile lamprey were recorded, in the majority of catchments. This was not particularly surprising, given the topography of the Swilly, Leannan, Bonet and Avoca catchments – all of which had extensive areas of hilly or mountainous terrain with channels liable to torrential flows. Many channels had limited habitat containing suitable sediments for juvenile lamprey. The Bandon catchment was a contrast, with good population density values and population structures at many sites.

At all sites, information was compiled on presence/absence (Figure 2.3), population density (Figure 2.4) and population structure (Figure 2.5) of juvenile lamprey. The presence/absence provided an immediate overview of the distribution in a catchment - identifying important sites or channels as well as possible problem areas. Of the nine sites surveyed on the main stem of the R. Bandon, seven contained lamprey juveniles.

Table 2.1. Summary lamprey data from catchments surveyed in 2009.

Catchment	Date (2009)	No. Sites	Mean Density (no./m^2)	Range (no./m^2)	No. Negative Sites	% Negative Sites	Brook/River Juveniles	Sea Juveniles	Transformers
Avoca	08/09	34	22.7	0 - 297	20	58.82	yes	no	yes
Bandon	10/09	35	8.1	0 - 34	15	42.86	yes	no	yes
Garavogue-Bonet	09-10/09	24	1.5	0 - 12	18	75.0	yes	no	no
Inny	08-09/09	67	1.4	0 - 12	47	70.15	yes	no	yes
Leannan	09/09	20	2.3	0 - 23	16	80.0	yes	no	no
Swilly	09/09	17	0.8	0 - 7	14	82.4	yes	no	yes

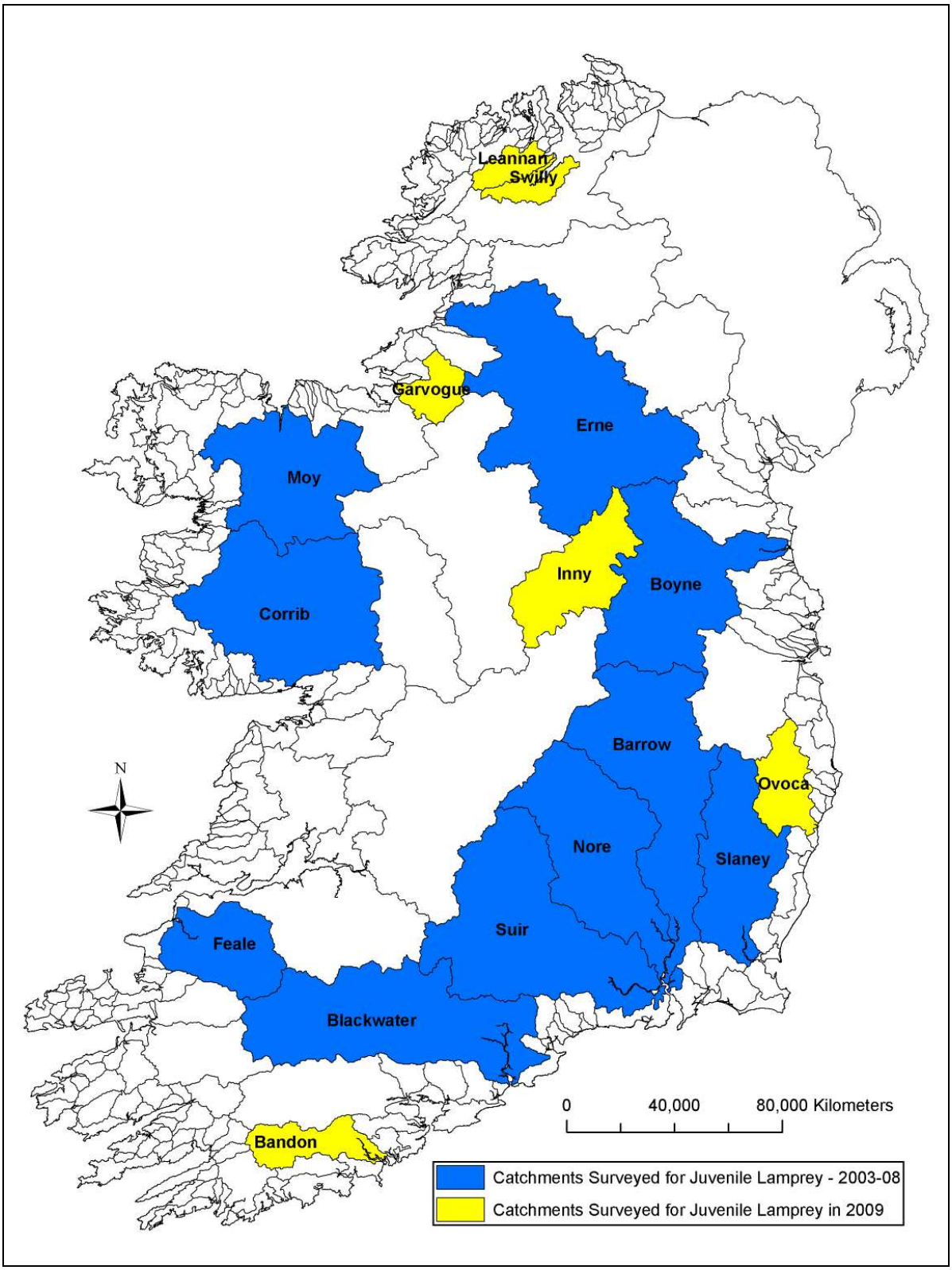


Figure 2.2. Catchments surveyed for juvenile lamprey between 2003 and 2009 (including NPWS – funded and Fisheries Board initiatives).

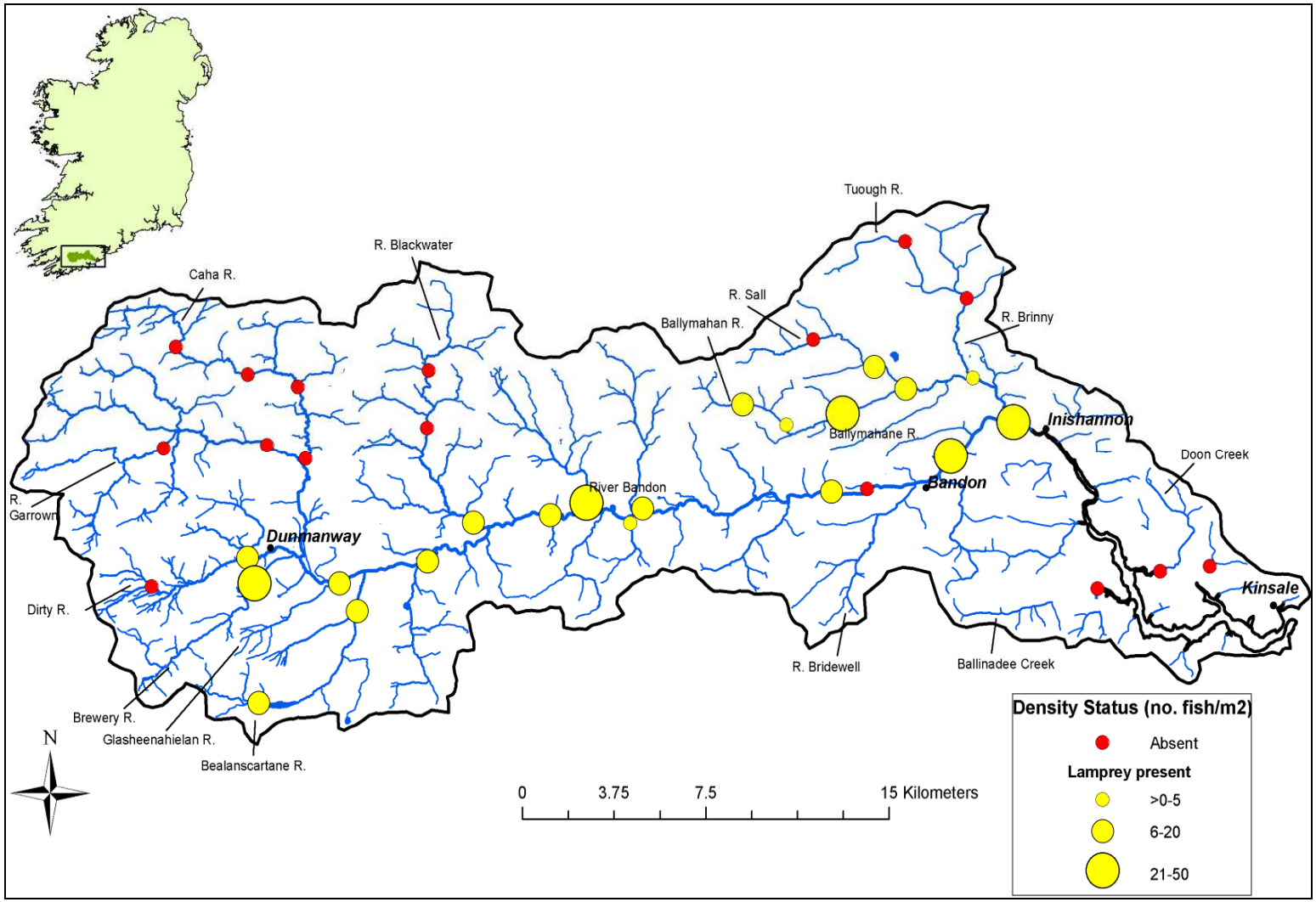


Figure 2.3. Map displaying sampling sites and density range of juvenile lamprey recorded in the Bandon catchment, October 2009.

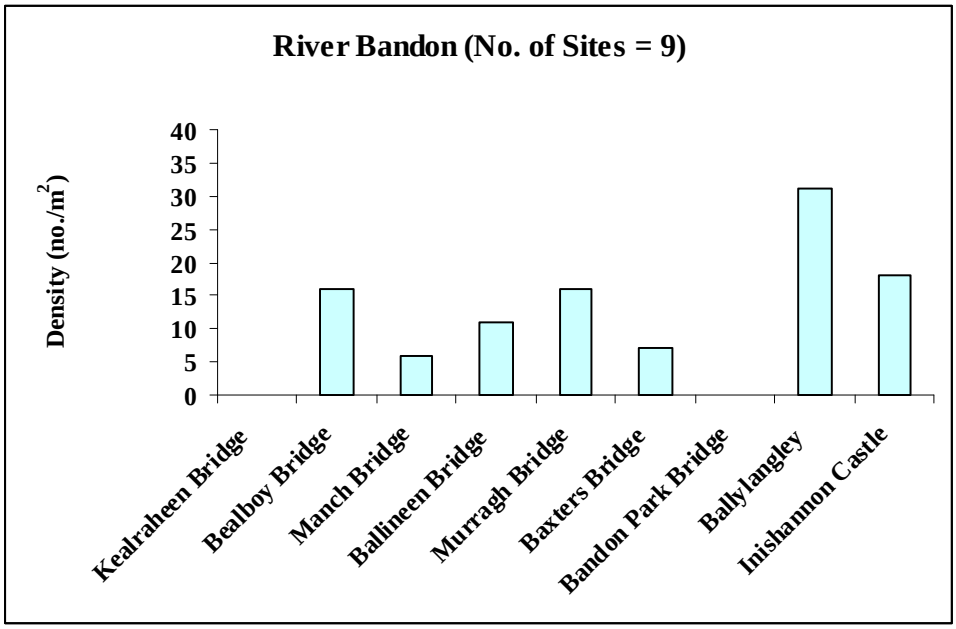


Figure 2.4. Juvenile River/Brook lamprey density (no./m^2) at sites on the main stem of the Bandon River, October 2009.

The low number of negative sites contrasted with findings from other catchments. Density values at positive sites on the Bandon main stem ranged from *circa* 5 to 35 /m^2. This would be indicative of a channel with a substantial population of juvenile lamprey.

The population structure from the pooled site information on the Bandon main stem indicated a range of sizes from 20 to 100 mm in length (Figure 2.5). The structure was dominated by larger fish in the 80 – 90 mm range. The small peak at 50 mm indicated another size or age group while the fish at 20 mm indicated some degree of successful spawning in the present year. A more balanced structure might be preferred from a conservation perspective but the presence of at least three age groups – based on the length frequency distribution – would be seen as very positive in overall conservation terms.

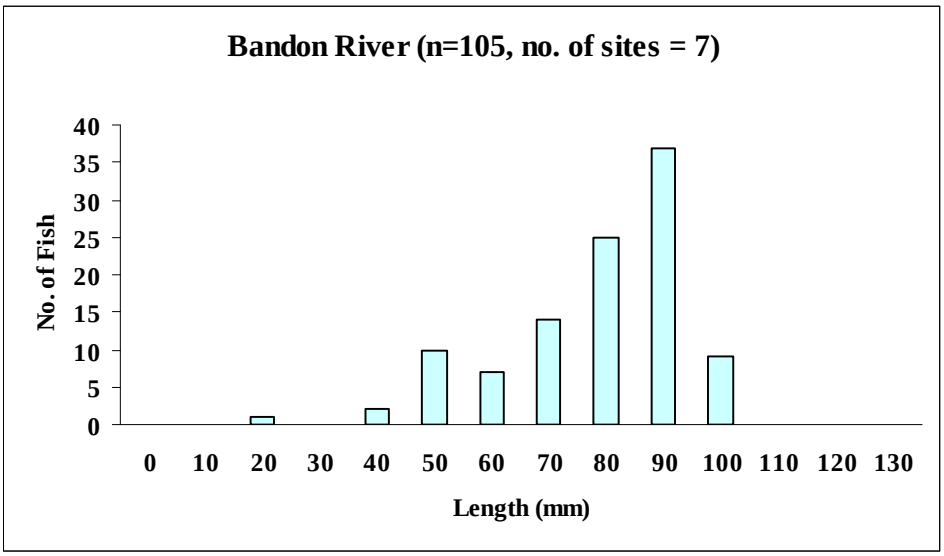


Figure 2.5. Juvenile River/Brook lamprey length-frequency (n=105), pooled for sites on the main stem of the Bandon River, October 2009.

2.2 Adult anadromous lamprey survey:

This package proposes to undertake work on both river- and sea lamprey adults in the 2009 – 2013 period. In the case of both species, it is proposed to trap adult fish in the lower reaches of major catchments, attach radio tags and follow the migrations of these fish. The trapping would be done using fyke nets (or other suitable nets) or electric fishing. The tagging process would enable fish to be followed and would, hopefully, lead Fisheries Board personnel to spawning sites. These are particularly important and are likely to be used by adult river and sea lamprey in successive years.

River lamprey ascend rivers from approximately August in the year prior to spawning. A large element of the run appears to occur in the October – November period. It was proposed to capture and radio tag fish in this latter period and follow their dispersal over the winter months up to spawning time in the following April - May. It is of particular interest to understand how far upriver this species travels and what type of habitat it uses in the winter period. It was hoped to track up to 50 fish in the Avoca and Owenavarragh systems and to follow dispersal. These were selected due to the known presence of river lamprey populations in both systems – the former through survey work with ERFB and the latter through mortalities in major fish kills investigated by ERFB. The rainfall and flooding events during November 2009 prevented any sampling effort in either catchment at the optimal sampling period. Netting was undertaken in mid December on both main channels with ERFB but no river lamprey were captured.

The trapping programme for sea lamprey would be undertaken in May - early June and tracking would then follow. In 2009, it was hoped to track up to 50 fish in each of the Corrib and Moy systems and to follow dispersal. In both rivers, the Regional Boards have monitoring systems (electronic counters, visualisation facilities and video referencing) to record movement of adult salmon. Sea lamprey and eel are also thus recorded. Despite close liaison with both WRFB (Corrib) and NWRFB (Moy), and netting operations being undertaken, no adult sea lamprey were captured for radio tagging in 2009.

As an adjunct to the sea lamprey programme, the project team undertook collection of baseline habitat features at sites where sea lamprey spawning was occurring in May – June 2009. The data included river bed samples for gravimetric analysis of materials used by these fish for redd excavation (Figure 2.6), measurement of redd dimensions, depth and gradient measurements at observed spawning sites. Samples of spawning-bed materials were taken from the River Mulkear at Annacoty, Co. Limerick, the River Shannon at Plassey, Co. Limerick, the Fergus and Millbrook Rivers near Ennis, Co. Clare and the Cong River in Co. Mayo.

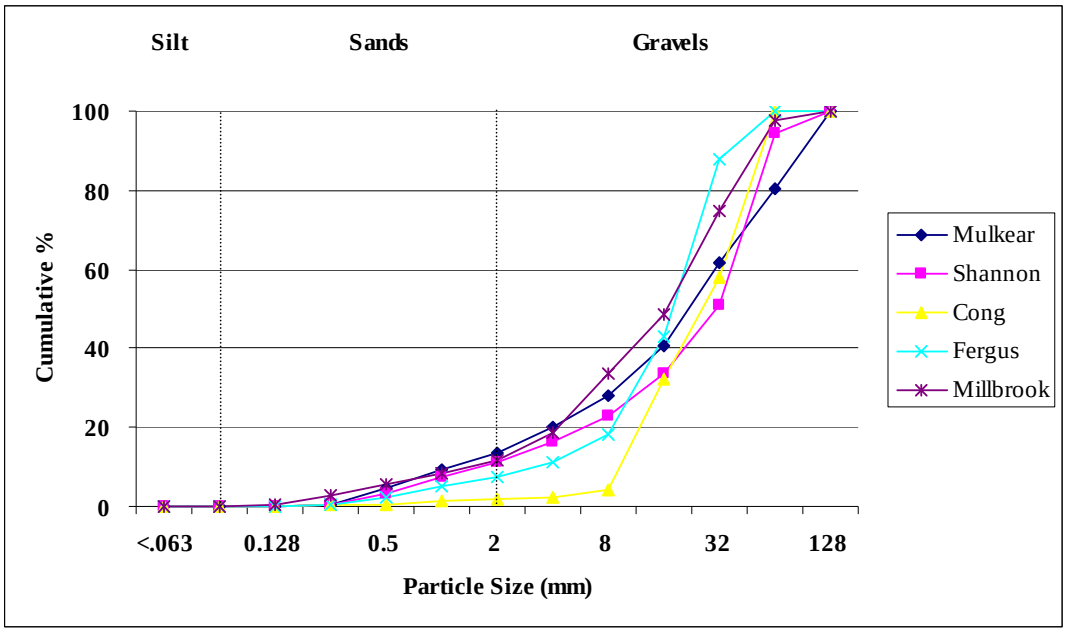


Figure 2.6. Cumulative frequency plots of sediment composition from five known sea lamprey spawning locations

2.3 Non-migratory adult lamprey:

The sea- and river lamprey normally live at sea as adults, attaching themselves to a wide range of host species. However, a limited number of non-migratory sea lampreys were

positively identified from Irish lakes in the late 1950's and early 1960's. These samples were provided by anglers – with a number of valuable results coming from Lough Conn and Lough Derg. These were again reported for L. Derg in the late 1990s in the ESB Fisheries Division's annual report.

Land-locked or non-migratory lamprey do not go to sea but will attach themselves to host fish in lakes. These hosts may well be the bigger fish present –adult salmon, large brown trout or adult pike. In 2007 the CFB undertook an information campaign with the North Western RFB, seeking assistance from anglers who might encounter 'eel-like fish' attached to rod-caught brown trout. Anglers were asked to watch out for attached lamprey or to notice round or disc-like scarring marks on the sides of fish – where the lamprey had been attached. This information campaign was again mounted in 2009 and featured on the CFB website with a fine photo of a freshly-caught brown trout from L. Derg with lamprey attached.

Figure 2.7. Trout captured on L. Derg with non-migratory sea lamprey attached, also specimen from Lough Derg captured during May 2009.

Anglers on L. Derg alerted both the Shannon RFB and CFB team to the occurrence of adult lamprey attached to brown trout caught on rod-and-line during the 2009 mayfly season. Colleagues in the Shannon RFB liaised with the anglers and some adult lamprey

specimens were retained for examination by the CFB team. Examination of the dental patterns indicated that the non-migratory form was the sea lamprey.

Figure 2.8. Dental structure of anadromous sea lamprey from coast off Ballycotton (left) and non-migratory sea lamprey from L. Derg (right).

Email correspondence was also received from L. Conn in Mayo and L. Leane in Kerry. Angler information from L. Conn corroborated the situation from L. Derg, with lamprey attachment being recorded during the mayfly season. In L. Leane, lamprey adults appeared to interest themselves in long-distance swimmers in the summer season and considerable information was provided by local swimmers, lake users and colleagues in the Killarney National Park.

The information provided and network of connections may facilitate a greater degree of data collection in 2010 and advance the story of these non-migratory lamprey further.

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 and L. Leane system for the Killarney shad. Survey investigations in 2009 focussed on the anadromous shad.

Figure 3.1. Adult and juvenile anadromous shad from the River Barrow.

3.1 Adult anadromous shad surveys:

Drift net sampling was scheduled for the upper reaches of individual estuarine waters to ascertain presence and relative abundance of anadromous shad. These fish would have migrated upstream, from the sea or from lower down in estuaries, to spawn in the upper reaches of the waters, around the upper tidal limit. Fish move into the spawning areas from late April and spawning occurs during May. The schedule included

- Slaney (ERFB)
- Barrow-Nore, Suir and Blackwater (SRFB)
- Bandon (SWRFB)

The Slaney, Barrrow-Nore, Suir and Blackwater are all designated as Special Areas of Conservation (SACs) under the Habitats Directive for Twaite shad. This species is more commonly found than Allis shad in Irish estuarine waters. The Bandon was selected in view of the similarity of its size and physical form to the SAC-designated waters and also in view of its proximity to the Munster Blackwater, where both Allis and Twaite shad have been taken.

Surveys were delayed until relatively late in May, due to issues of project initiation and flood flow conditions in the channels. The latter are known to impact adversely on adult shad movements. A series of timed drifts was undertaken in each water (Figure 3.2 – 3.4) using panels of net. Two types of net were used, braided and monofilament. It was found that the braided net was more suitable for the exercise as it tended to snag less on debris in the river. The nets were set from a boat. A GPS reading was taken at the entry point of the net to the water. Once the full net was in place, a stop watch was used to time the length of the drift. The net was allowed to drift with the flow and fished for a maximum of 30 minutes, or until such a time as an obstruction to the movement of the net was encountered. The point where the net was lifted from the water was marked using a GPS and the time the net drift for was also recorded.

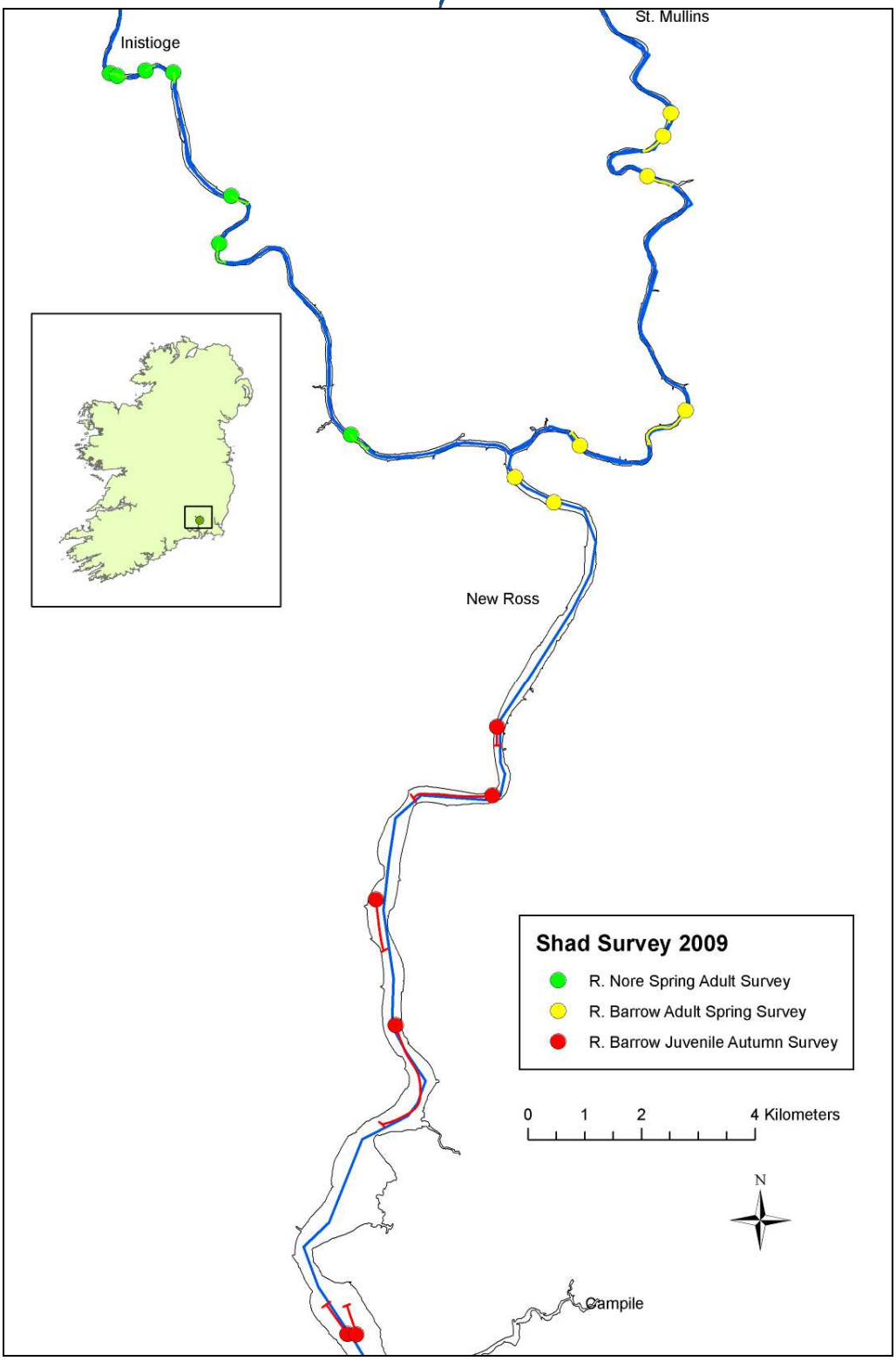


Figure 3.2. Locations of Shad sampling surveys on the Rivers Barrow and Nore, 2009.

While the drift net strategy was used with success in 2005, no adult shad were encountered in the surveys on the Barrow-Nore, Suir or Blackwater in 2009. This finding contrasted with the very positive angling reports from St. Mullins for 2009, adjacent to the spawning areas on the R. Barrow. It is possible that the netting effort came late in the season and that large numbers of fish had moved upstream of the netting stations and were thus not available for capture. The Slaney and Bandon were not surveyed, given the negative results from the other waters.

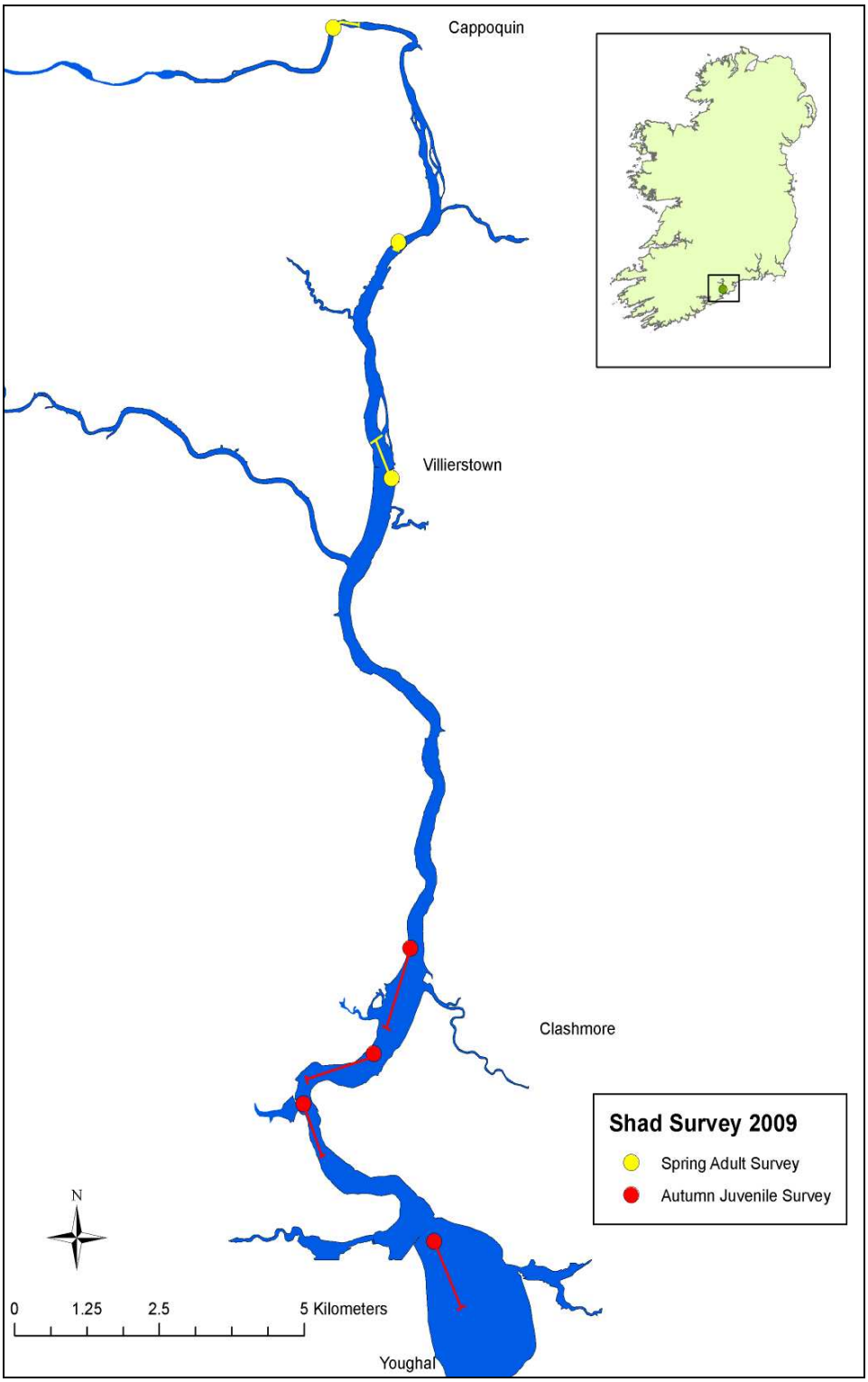


Figure 3.3. Locations of Shad sampling surveys on the River Blackwater, 2009.

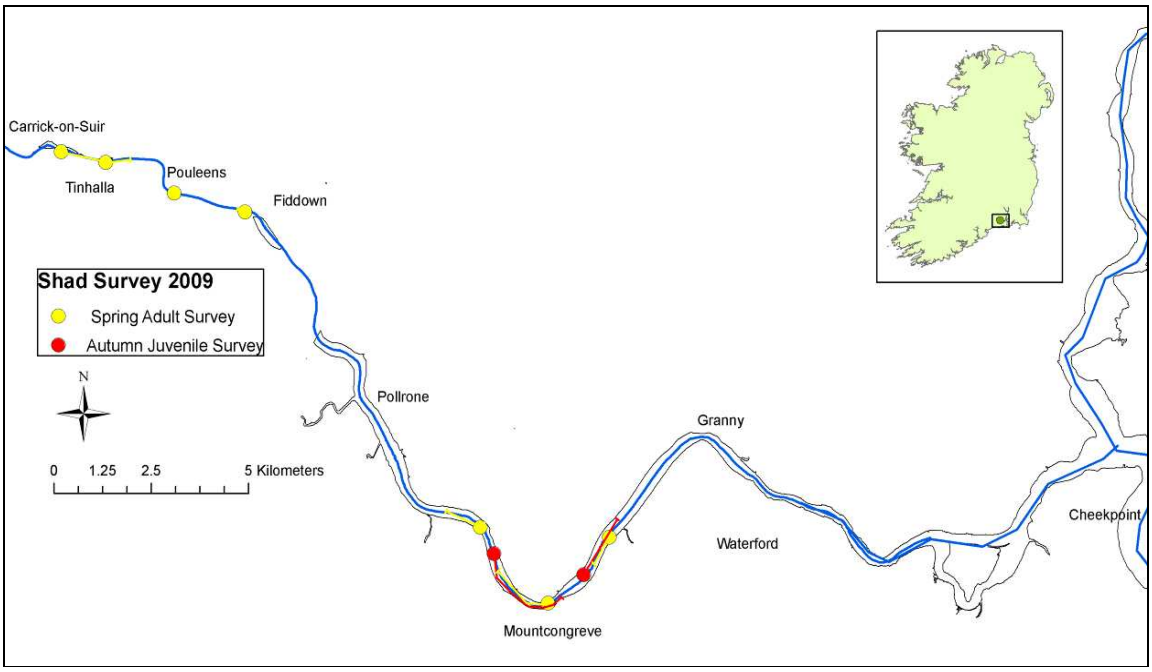


Figure 3.4. Locations of Shad sampling surveys on the River Suir. 2009.

3.2 Juvenile shad surveys:

This involves a netting programme in the same SAC waters examined for adult fish. This survey package is undertaken in the autumn period – the latter part of October being a target. In contrast to sampling for adults, the juvenile sampling is undertaken in the lower reaches of the individual estuaries. Following spawning, the ripe shad eggs may drop to the channel bed while a proportion drift with the tidal movement. The young larvae grow and young fish may attain a length of *circa* 9 cm in the autumn of their first year. During this period, the young fish remain in the upper reaches of the estuary, drifting and moving slowly downstream.

Sampling in 2005, using a paired trawling technique, successfully captured samples of young-of year shad in the lower reaches of the Barrow and Suir SACs. These trials were undertaken with commercial fishermen and using small half-decker craft. The same fishermen worked with CFB and Southern RFB staff in 2009, again using a paired trawling technique. Sampling took place in early November, close to the optimal period and a series of timed trawls was undertaken in each water (Figure 3.5). Two large SRFB

RIBS were used to trawl a smaller size net than that used in 2005. As with the sampling for adult shad, a GPS reading was taken at the point where the trawl was fully set to fish. Once the full net was in place, a stop watch was used to time the length of the trawl. The net was allowed to fish against the flow for a maximum of 30 minutes, or until such a time as an obstruction to the movement of the net was encountered. The point where the net was lifted from the water was marked using a GPS and the time the net drift for was also recorded.

Figure 3.5. Paired trawling for juvenile shad on the River Blackwater, November 2009.

No juvenile shad were taken in any of the waters surveyed – Munster Blackwater, Barrow or Suir. Significant samples of smelt were taken and these constituted a valuable 'by-catch' of conservation importance.

3.3 Review:

Sampling of shad status has been undertaken by CFB on a number of occasions since 2000 in the designated SAC waters. To date, no consistent degree of success has been achieved using any method. Liaison with colleagues in the UK has identified the same difficulties. It is essential to develop a sampling protocol that will give repeatable results and that will provide an assessment of shad status. Given the previous success of spring adult sampling and of autumn sampling for juveniles it is proposed to pursue these approaches further in 2010. Sampling for eggs in the river plankton is another available strategy and this will be undertaken in the appropriate window in 2010.

4. Pollan Programme

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

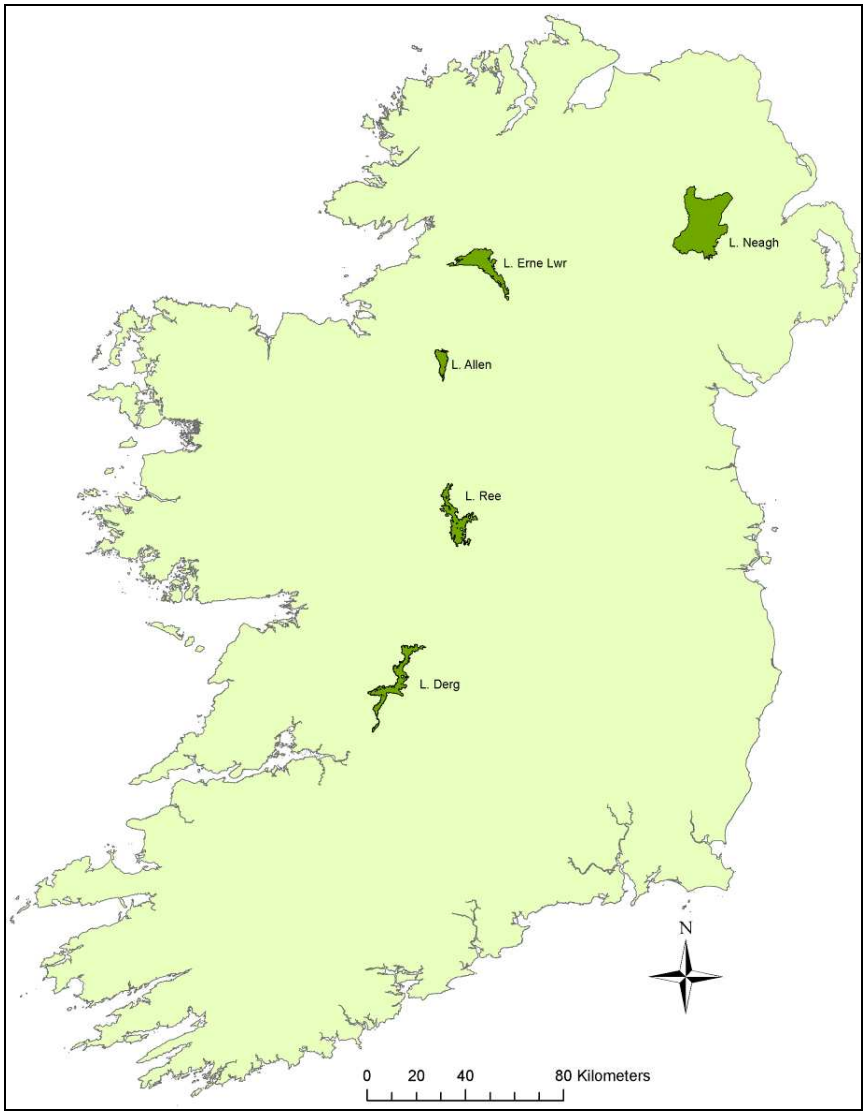


Figure 4.1. Locations of pollan lakes in Ireland.

In 2009, the survey team linked in with the Water Framework Directive (WFD) fish survey team. The WFD had scheduled L. Derg for survey in 2009, to be undertaken with

the Shannon RFB. This would generate information on pollan, as well as the other fish species present. Additional focussed sampling for pollan was also scheduled. This approach would be cost-effective, accommodating both WFD and Habitats Directive requirements. The WFD survey included both conventional netting and remote sensing with hydroacoustics. The latter identified patterns of fish occurrence, in one deep-water area of the lake, considered to be representative of pollan patterning. However, ground truthing with nets did not yield any pollan. Nor were pollan taken in any of the nets set over the two –week sampling period in early July. These findings show up the difficulties of monitoring for species present in small numbers in a large waterbody.

Figure 4.2. Pollan from eel net by-catch, Killaloe, Autumn-Winter 2009.

A proposed follow-up survey looking for spawning pollan and for spawning areas was scheduled for selected areas of L. Derg in the November – December period. However, the high rainfall and associated flooding events led to very elevated water levels in L.

Derg, with extensive flooding of lands adjoining the lake. In these circumstances it was not feasible to undertake the proposed survey.

Pollan, presumed to be of L. Derg origin, were made available by colleagues of the Shannon Regional Fisheries Board. These fish came from by-catch of eel nets set at Killaloe. Individual fish were found over a period of different dates from early November to mid December 2009. All fish were young, in the 9 - 17 cm size range (Figure 4.3), and all were sexually immature. The presence of two distinct size groups, even in such a small sample, would point to the presence of two age groups, indicating that spawning of pollan is ongoing.

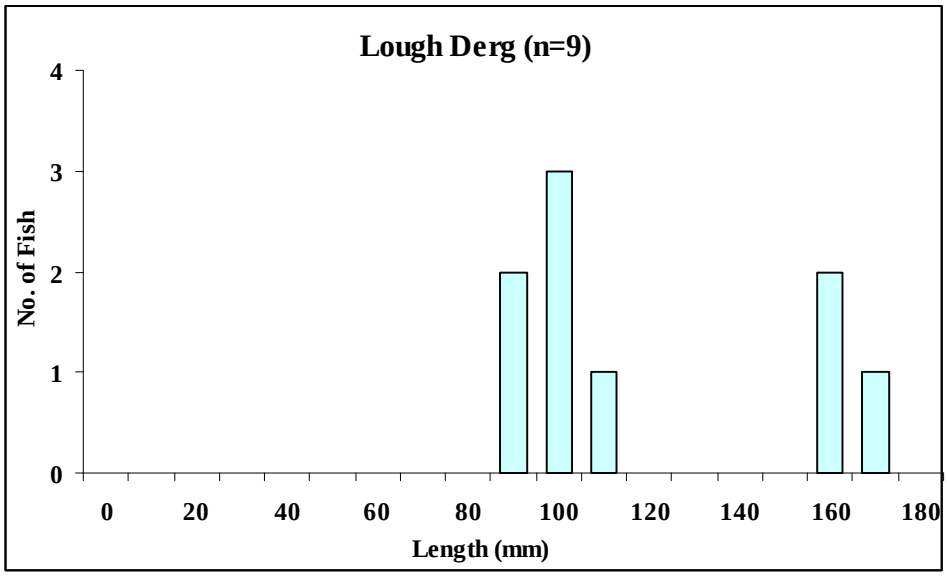


Figure 4.3. Length-frequency of pollan from eel net by-catch, Killaloe, Autumn-Winter 2009.

The All-Ireland Species Action Plan (SAP) for pollan identified the tenuous status of the species in its known habitats on the island, apart from the apparently robust population on L. Neagh. The idea of creating 'reservoir' or 'ark' populations as a conservation measure was one of the proposals in the SAP. The underlying idea is that ripe adult fish would be captured from e.g. L. Derg and be stripped for rearing-on of juveniles. These juveniles

could then be introduced into a ‘donor’ water or ‘reservoir’ where the physical, chemical and biological conditions would permit them to grow on, survive and spawn in turn. These would be the unique genetic progeny of the parent lake and could be used to re-populate the parent lake, as well as acting as a genetic reservoir. In essence, one such ‘reservoir’ would be required for each Irish lake population. Successful artificial fertilisation and on-rearing has been undertaken at the Movanagher Hatchery in Northern Ireland. During 2009, CFB staff involved in fish husbandry visited the Movanagher unit and reviewed husbandry requirements with staff there. CFB then proceeded to prepare facilities at the Roscrea fish farm with a view to captive breeding being undertaken. Unfortunately, due to the impossibility of sampling for ripe pollan in the latter part of November – December, no actual husbandry work was undertaken in 2009.

5. Smelt Programme

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.

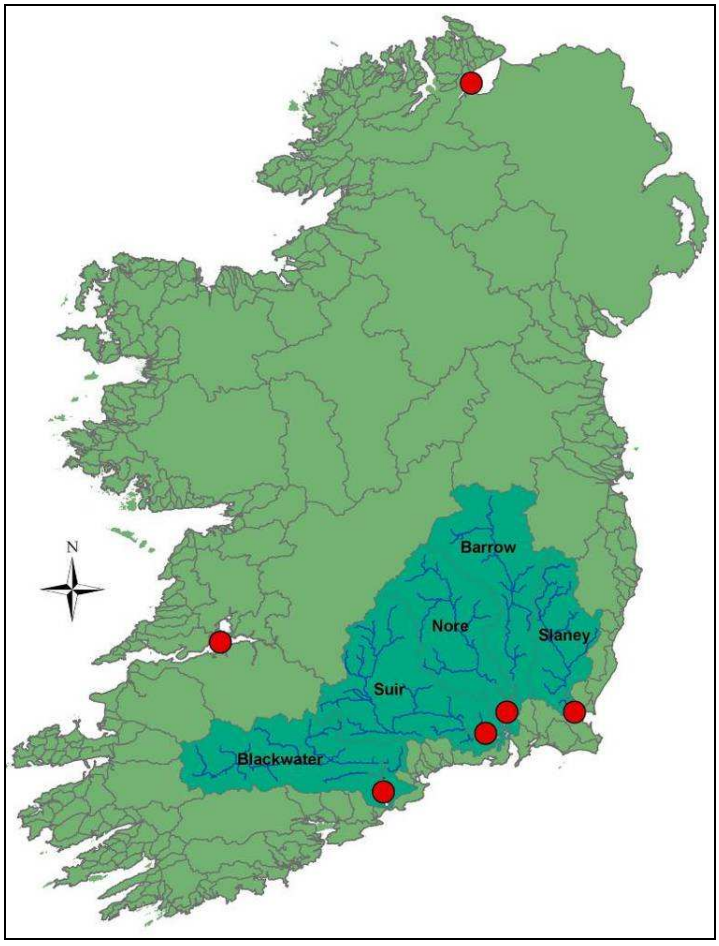


Figure 5.1. Map of Ireland indicating locations of smelt populations.

5.1 Spawning surveys:

In March 2009, overnight fyke netting was undertaken with Southern RFB staff in the upper tidal limit areas of the Munster Blackwater and Corock systems to ascertain the presence of ripe or spawning smelt. Ripe adult fish, both males and females were captured in the case of the Blackwater (Figure 5.2). No smelt were encountered in the Corock estuary, discharging to Bannow Bay.

The sample of smelt from the Blackwater ranged in size from 150 – 220 mm (Figure 5.2). The sample was dominated by male fish, suggesting that the spawning run was at an early stage, the proportion of females rising later in the run.

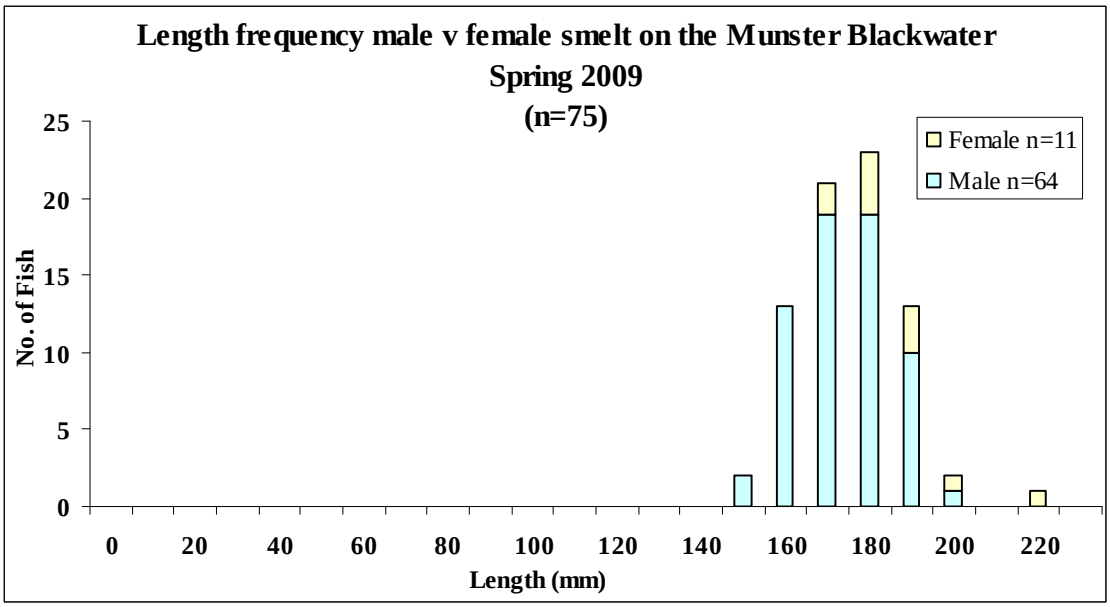
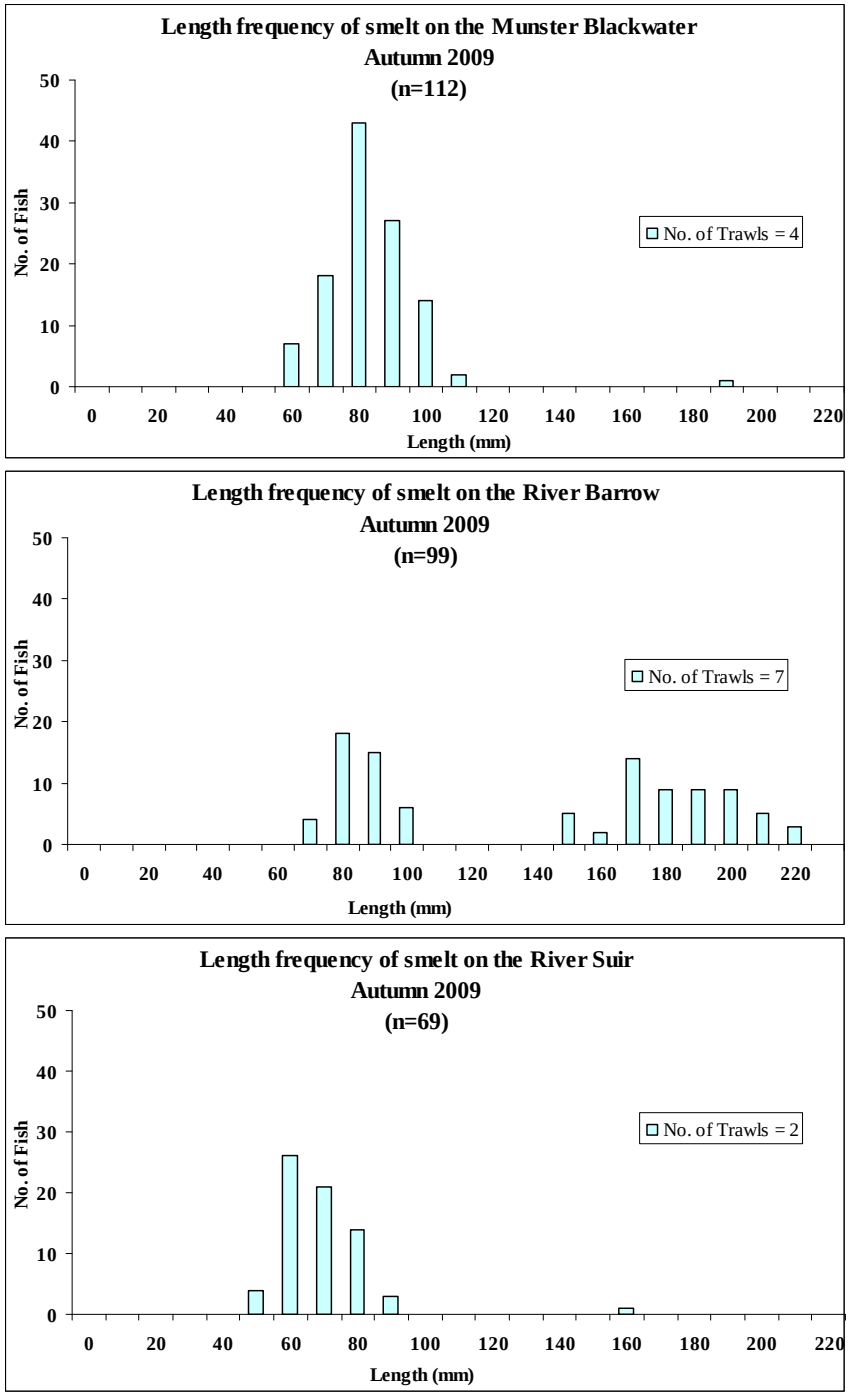


Figure 5.2. Length frequency of male and female smelt captured on the Munster Blackwater during Spring 2009.

5.2 Juvenile smelt – recruitment surveys:

This dataset was compiled in the course of the autumn trawl sampling for juvenile shad in the southeast (see Figure 3.2 above). While the sampling was undertaken in open-water stations in the lower reaches of the three estuaries, a range of size classes of smelt was

captured indicative of recruitment occurring from spawning in Spring 2009 (Figures 5.3-5.5).



Figures 5.3-5. Length frequency of smelt captured in trawl nets on three southern estuaries.

6. Char Programme

Populations of char are known to occur in a number of lakes – primarily in small lakes along the western seaboard, (Figure 6.1). Char have been lost in the last twenty years from some large Irish lakes such as L. Conn and L. Corrib and are considered very susceptible to enrichment and competition from other fish.

Surveys of char lakes have been undertaken by the Irish Char Conservation Group. In addition, a number of lakes known or suspected to harbour char are listed on the CFB's WFD Lake team's 3-year rolling monitoring programme. Thus, any survey work undertaken in the context of Red Data Book species monitoring will use a streamlined approach to ensure that doubling-up of survey activity does not occur.

Figure 6.1. Brown trout (top) and char (bottom) captured in Lough Nalughraman, September 2009.

In 2009, the CFB was requested to survey two lakes in Donegal by the Northern RFB. Both have been modified to facilitate water abstraction for potable supply. Fish stock surveys undertaken prior to commencement of infrastructural works for the abstraction indicated the presence of char in both lakes. The abstraction process has the potential to impact adversely on the ecology of a water, particularly the littoral or shoreline area.

Drawdown of water for supply may lead to areas of the lakeshore becoming exposed and drying out. This may lead to stranding of invertebrate populations e.g. snails and a range of immature insect life, as well as drying out of submerged stands of aquatic plants. Depending on the extent of drawdown of water, the lake surface level may fluctuate rapidly and frequently. Char spawning occurs in the gravelled areas in the lake littoral zone. The char excavate redds in the gravel and lay their eggs. If the water level is lowered substantially after spawning, and prior to emergence of juveniles, the immature char may be subject to exposure and desiccation, with the redds becoming stranded. The Northern RFB was anxious to assess the status of char and other resident species following completion of works and commencement of abstraction in both Lough Nalughraman, (Figure 6.2) and in Greenan Lake. Surveys were undertaken in September 2009 with staff of the Northern RFB. The netting technique used matched that in use by the WFD Lakes team in CFB, thus permitting an exchange of data and provision of additional material to the WFD database.

Figure 6.2. Lough Nalughraman, Donegal, sampled during September 2009.

The surveys indicated the presence of char in both lakes examined. Char in L. Nalughraman ranged from 70 to 190 mm, with a predominance of fish in the 140 – 160 mm range (Figure 6.3). The L. Greenan sample spanned a narrower range, 110 – 160 mm, with no smaller or larger fish. Male and female fish were captured in similar proportions on both lakes and spanned the full size range in each water (Figures 6.4 and 6.5).

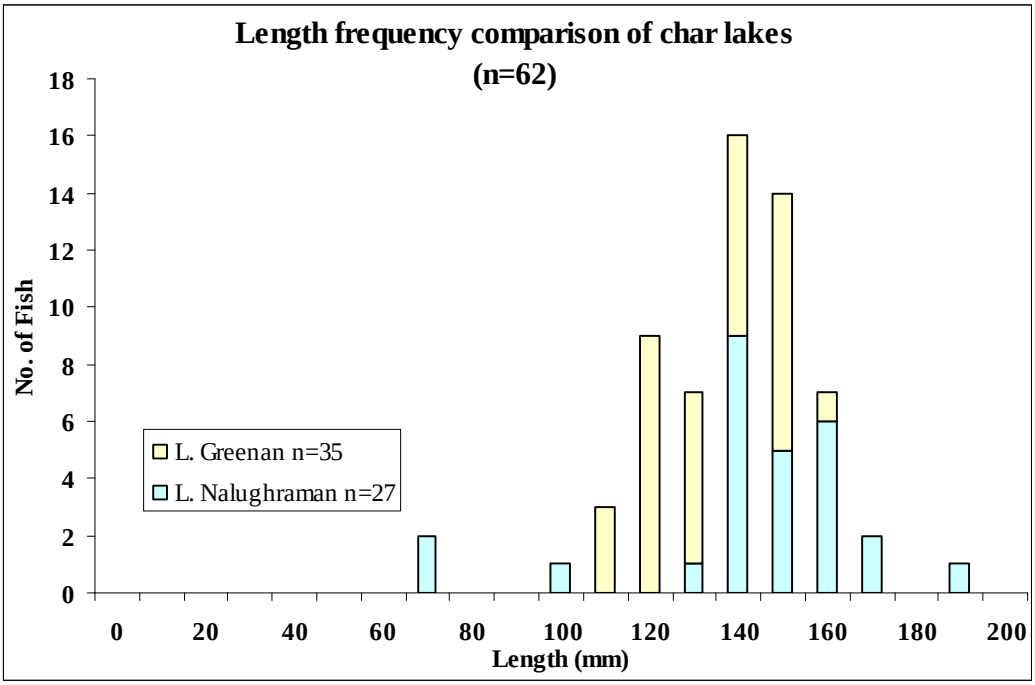
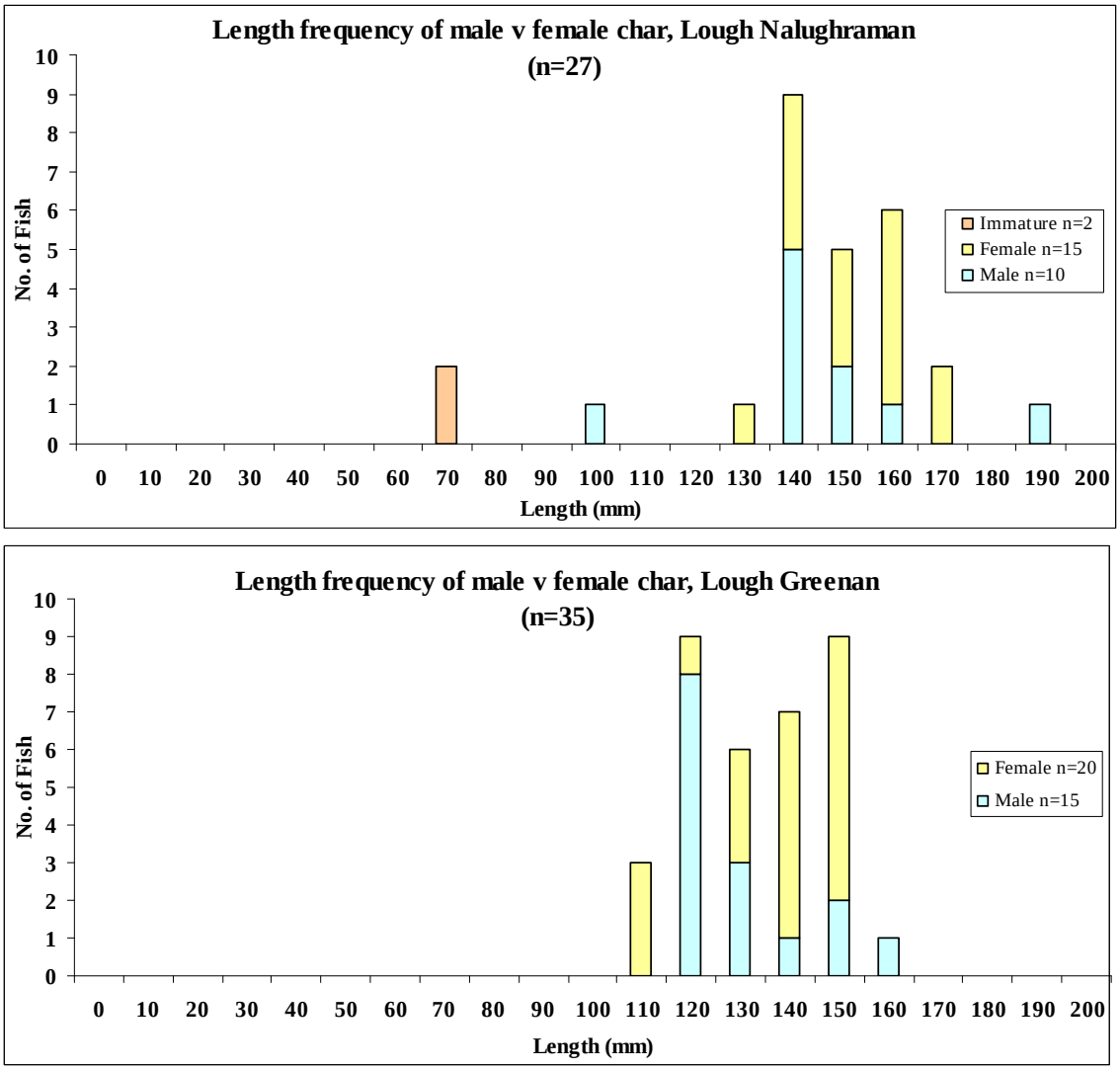


Figure 6.3. Length frequency distribution of char in two Donegal lakes, based on netting survey, September 2009.



Figures 6.4 - 6.5. Occurrence of male and female char among length distributions in L. Nalughraman (top) and L. Greenan (bottom), September 2009.

7. Looking Forward

The surveys undertaken in 2009 form part of an overall suite of works that require to be completed by 2013. This is the next 'due-date' for reporting to the EU on the status of Annex II species within the national territory. This latter is significant for, while species under Annex II of Habitats Directive must have Special Areas of Conservation (SACs) designated for them, the report on status to the EU relates to the species and its status throughout the national territory, not just within SACs.

The lamprey programme will have a further suite of catchments targeted in 2010, as this is the most cost-effective strategy in determining status, distribution and health of populations in channels. It is hoped that Regional Fisheries Board staff will be in a position to play a key role in the actual surveys, as per the catchment-wide programme for juvenile salmon. It is planned to have all major i.e. large, catchments surveyed for juvenile lamprey status by 2013. Thus will provide a baseline from which a subsequent round of monitoring can be developed, with emphasis on those channels with suitable habitat attributes capable of retaining viable spawning and nursery grounds for lamprey species. Delineation of spawning grounds for each species will also proceed up to and beyond 2013. Where spawning areas are identified, these locations can be assessed annually by staff of IFI to determine degree of spawning, as is the practice for salmon and brown trout. Use of telemetry may be appropriate in catchments where channels are accessible to recorders and the catchment is not excessively dendritic. In such cases, trapping and radio-tagging of upstream-migrating adult fish should permit identification of barriers or obstructions to migration as well as pinpointing the actual areas of spawning.

Surveys to date point to low population levels of shad and development of sampling protocols that yield consistent outcomes has proved problematic. Autumn estuary-based recruitment surveys for juvenile shad have a synergy with smelt recruitment surveys. Use of new and developing technologies, including ROVs (Remotely-operated vehicles), hydroacoustics and dual-beam or DIDSON imaging may provide direct visual means of assessing presence of adult shad on the spawning grounds in the SACs of the southeast.

The support of regionally-based staff with local expertise of estuarine and tidal conditions is fundamental to successful surveying for shad and other species in estuarine waters.

Assessing the status of pollan has also proved problematic in 2009. The strategies adopted on L. Derg, including the synergy with the CFB's Water Framework Directive fish survey team, was appropriate and facilitated a substantial netting effort on the target water. The same overall sampling approach, for adult fish in summer and for spawning grounds, will be pursued in 2010 on L. Ree.

The char sampling protocol used in this report mirrors that used for netting lakes by the CFB's WFD team. In addition, the WFD team has a suite of waters to survey on a 3-year rolling cycle. Several of these contain significant populations of char and the information generated can feed into an overall IFI-National database on this species. The selection of lakes in any year to be surveyed by the Habitats Directive and Red Data Book fish species team will be made from the broader available listing of 'char' lakes, excluding those covered by the WFD team.

To date, conventional netting techniques have proved suitable in sampling for adult spawning populations of smelt and in assessing recruitment. These strategies will be continued. In addition, sampling must be extended to the other waters where smelt have been reported on the island of Ireland. This will involve liaison with colleagues in the Shannon Regional Fisheries waters within the extensive Shannon estuary as well as liaison with colleagues in the Loughs Agency and Northern Ireland Environment Agency in the waters of the Foyle system.

In the medium and longer term, the sampling and monitoring programmes should lead to:

- Development of rigorous and repeatable sampling protocols that provide information on status of target life stage of the species in question
- Data sets that contribute to informed management decisions
- Identification of necessary measures to safeguard or conserve specific taxa. These may include legislative instruments, such as bye laws to manage exploitation, and

conservation measures, such as removal or modification of artificial barriers to fish passage (up- and down stream).

Project Personnel and Acknowledgements

The Central Fisheries Board team involved in the Habitats Directive and Red Data Book fish investigations comprises 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 Regional Fisheries Boards and thanks are due to the Assistant CEOs and Inspectors, who organised logistics and support, and to officers within each district.

The Inny and Bonet catchment-wide lamprey surveys were undertaken directly by locally-based staff, working closely with the CFB team. Particular thanks are due to Mr. Paul Condon, on the Bonet, and to Mr. Tony Robinson and Mr. Peter Ruane on the Inny for their diligent work in tracking down juvenile lamprey and compiling the necessary field data.