

Research Summary Report 2013



INLAND FISHERIES IRELAND

RESEARCH AND DEVELOPMENT REPORT 2013

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Chairman's Statement



The 2013 Research Summary provides an outline of the research related projects and activities undertaken by the Research and Development (R&D) division of Inland Fisheries Ireland during the past year. On behalf of the Board of Inland Fisheries Ireland, I would like to compliment the R&D division on the applied research conducted and the resulting analyses, which are essential in providing managers with appropriate knowledge to support the conservation, development and protection of Ireland's inland fisheries resource.

The current economic climate and resultant budget reductions and staffing constraints place limitation on the amount of research that can be conducted. These restraints, which have now been in place for a number of years, have demanded increased operational efficiencies, a prioritization of projects and delivery of multiple outputs from each survey.

This report while capturing at a high level some project-based activities, does not document the other roles of the R&D division. These roles include the provision of expert advice pertaining to the inland fisheries resource across several government departments, the servicing of Ireland's reporting commitments on a number of EU directives and regulations, significant contributions to numerous consultation requests from a diverse range of sources and provision of a research licensing service.

The Board of IFI recognises the expertise, experience and dedication of IFI scientists and research staff, and their contribution to the conservation and protection of our valuable inland fisheries resource. I would like to take this opportunity to thank all those who have contributed to research activities within Inland Fisheries Ireland and to the IFI regional-based staff, without whose local knowledge and expertise many of the survey programmes would not be completed.

Brendan O'Mahony
Chairman
Inland Fisheries Ireland

Foreword



Welcome to Inland Fisheries Ireland's Research Summary report which précis the objectives and outcomes of some of IFI's larger projects. The intent of this report is to give the reader a sense of the applied research role rather than to document all the projects and areas of advice delivered during 2013.

IFI's R&D function is tasked with delivery on a key national strategic goal "to develop and deliver high quality, cost effective, applied scientific research and development services to meet the IFI's customers' needs". This goal is to be delivered through:

- conducting scientific research on fisheries to deliver economic and heritage benefits by ensuring sustainability and conservation of fish in their ecosystems
- conducting research in conjunction with sister agencies to provide advice for the management and understanding of ecosystem function in aquatic fisheries habitats
- ensuring adherence to operational procedures which harmonize with our environment and cultural heritage
- supporting and preserving the quality and diversity of aquatic ecosystems and ensuring compliance with relevant European Union and national legislation
- providing an advisory service to relevant bodies.

While this foreword will not enable me to comment directly on each project, I will take the opportunity to highlight a couple of success from 2013. A study on the impact of seal predation on salmon stocks in the Slaney and Moy rivers was completed. This is an issue of considerable public interest. In addition, the international Celtic Seatrout Project management report was submitted to INTERREG Iva. It is wonderful to be involved in such international research projects but it is a matter of real pride to have delivered against these project goals.

Many of the projects outlined are conducted in partnership with other agencies and academic institutions and are focused on delivery of the requirements of national and international legislation and commitments. There continues to be a strong focus on ensuring that a national coordinated approach is brought to research programmes and, that duplication of work is avoided by collaboration and sharing of information.

Finally, I would like to thank all the R&D staff for their expert contributions and dedication over the past year. I would also like to acknowledge the support, knowledge and expertise provided by regionally-based IFI staff, without whom all research projects would have struggled.



Cathal Gallagher
Head of Research and Development
Inland Fisheries Ireland

Name of project

National Eel Monitoring Programme (EMP)

Remit of project

The EC Council Regulation 1100/2007 (EC 1100/2007) establishes measures for the recovery of the European eel (*Anguilla anguilla* L.). This regulation is a response to advice from the International Council for the Exploration of the Sea (ICES) that the European eel is endangered and that the fishery is unsustainable. EC 1100/2007 requires Ireland to establish an eel management plan to reduce eel mortality and to ensure an increase in the number of silver eel escaping Ireland to spawn. An Irish eel management plan was subsequently proposed and involved closure of the fishery, mitigation of hydropower, enhancement of upstream eel migration at barriers and improvement in water quality. In June 2009 the EU accepted this Irish national plan as adequate to address regulatory requirements for eel conservation. A review of the management plan was sent to the EU in June 2012. Monitoring objectives for the time period 2012 – 2015 were outlined with the next review due in June 2015.

Why is the project being undertaken?

The eel management plan contains a number of monitoring objectives to ensure compliance with the management actions. Inland Fisheries Ireland was tasked with carrying out these objectives.

The objectives are:

- To estimate silver eel escapement (in collaboration with the ESB, NUIG and Marine Institute)
- To estimate silver eel escapement indirectly using yellow eels
- To monitor the impact of fishery closure on yellow eel stock structure
- Inter-Calibration with Water Framework Directive sampling
- To compare current and historic yellow eel stocks
- To establish baseline data to track changes in eel stock over time
- To evaluate impediments to upstream colonisation/migration and water quality effects
- To determine parasite prevalence and eel quality

Planned completion date

Ireland is obliged to report to the EU on a three-year cycle. The first review of the current three-year management plan was completed and sent to the Department of Communications, Energy and Natural Resources (DCNER) in June 2012 (2009–2012). The 2012-2015 review is due in June 2015

Who will benefit from the project?

Information from the project will support evaluation of the current status of the national eel stock and the impact of measures undertaken under Ireland's eel stock management and recovery plan. This information is also sent to the ICES/EIFAAC Eel Working Group for international assessments.



Plate 1 Elvers ascending a wall on the River Inagh 2013.

When will interim/final reports be available?

The annual report of the eel monitoring programme will be due in May 2014. A review of the three-year cycle will be due in June 2015.

Progress to-date

Monitoring of elver recruitment in Ireland was successful for the 2013 season with six sites around the country reporting catches (Liffey, Feale, Maigue, Inagh, Corrib and Ballysadare). An increase in catches was reported for five of the sites - corresponding to reports from the UK and France of an increase in recruitment for the 2013 season. However, the recruitment of eels around Europe remains at less than 10% of historic levels and it is essential to monitor recruitment trends in the coming years.

Monitoring of yellow eel populations in Irish lakes and rivers was continued in 2013 with intensive fyke net surveys undertaken in Lough Derg, Lough Muckno, Lough Key and the Barrow River. A new semi-quantitative electrofishing technique was trialed in the Fane catchment in July 2013 in order to assess eel density. Thirty locations around the catchment were fished using the semi-quantitative method and nine sites were fished using the standard three-pass depletion method. The semi-quantitative method proved beneficial in assessing a catchment with 30 sites assessed in a two-week period, compared with nine sites in one week for the quantitative method. Further investigations of the new technique are required.

For the last three years, the silver eel fishery on the Clarbane River has been dominated by a migration peak in October-November, depending on environmental conditions. Total catch for 2013 was 1,151kg; this represents a large increase on the catches in 2011 and 2012 (448kg and 290kg respectively). A mark-recapture study to determine the efficiency of the fishing sites reported a 20% recapture rate; the rate calculated for the 2011 season was 23%.



Plate 2 Eel release at Lough Muckno 2013.

Findings of interest

Acoustic tracking of eels in the Barrow has continued, with ten eels tagged in July 2013. A number of mobile tracking sessions were undertaken to determine whether eels remained in the area but outside the range of the acoustic receivers. Of the 10 eels tagged in July, eight of the eels were still being detected on the fixed or mobile receivers in the study area in October. One eel had taken up residence beside a receiver and was being detected continuously. Currently, there are 30,751 detections, supporting estimates of how long a given eel spends outside the study area – perhaps while foraging for food. However, it is uncertain how far individual eels travel during that time. It appears that the distance between the fixed receivers (1km) is too large to pick up daily movements of the eels. Hence, additional receivers are required in order to determine how far the eels travel while foraging.

Next steps

Additional silver eel study sites are required in order to fulfill the regulatory requirements imposed on Ireland, and to ensure that we meet the escapement target of 40% of historic silver eel abundance,. IFI thus proposes to establish a new research site in 2014.

One of the management and monitoring objectives of the eel management plan is to enhance the upstream migration of eels. The EMP team has been working with the IFI Barriers Group and with staff in the Eastern and Shannon International River Basin Districts (RBD), who are undertaking barrier assessments to ensure we can meet this objective for the 2015 Eel Management Plan review.

PROJECT TEAM	Dr. Ciara O'Leary Dr. Gustavo Becerra Jurado Dr. Robert Cruikshanks Dr. Paddy Gargan
TOTAL BUDGET €	205,765
FUNDING SOURCE	Department of Communications, Energy and Natural Resources.
RESOURCES UTILISED	IFI local staff, boats, fyke nets, laboratory, freezer, biosecurity facilities.
DELIVERABLES	Annual report, _Standing Science Committee for Eel report.

Name of project

Salmon Conservation Limits Attainment project

Remit of project

The general decline in salmon stocks internationally over the past two decades has led to significant changes in the way that salmon are managed in Ireland since 2007. Scientific assessment has resulted in the decision of managers to close many salmon rivers to commercial fishing and angling. Salmon stocks in each individual river are assessed scientifically and if best available information indicates that there is less than the number of salmon required to spawn in each river (the salmon conservation limit, CL) then no exploitation is permitted. This approach aims to conserve salmon stocks. For example, in 2012, 58 rivers were identified as having a surplus over the CL. Eighty-five rivers had no identifiable surplus or insufficient information to carry out an assessment was available; these systems were closed to salmon harvest by commercial fishing or angling. Direct counts of adult salmon by counters or estimation from rod catch data from fisheries open to angling (harvest or catch-and-release fisheries) provides an assessment of adult salmon abundance in many rivers. Where no assessment method is available due to fishery closure or because there are no direct counting facilities, estimates of juvenile salmon fry abundance (from catchment-wide (CW) electrofishing have provided a quantifiable threshold value, which when exceeded, allows management to open the river for catch and release angling in the subsequent year. This type of assessment has been carried out at over 4000 sites in 124 rivers since the programme began in 2007. In many systems it is the sole means of assessing performance although it cannot be directly related to CL attainment levels.

Under the CL Attainment Programme, the efficiency of partial counters on a number of salmon rivers is being investigated using Passive Integrated Transponder (PIT) tag technology. PIT counts are then raised to an overall river estimate using raising factors that are currently being refined. The efficiency of the partial counter on the River Boyne at Blackcastle is being assessed by tagging adult salmon in the lower reaches of the river. The number of tagged salmon ascending two of the six counting channels on the weir is being monitored. A proportion of PIT tagged fish are radio tagged to determine the proportion of fish migrating up to and above the weir. Data are being accumulated across years in order to develop a robust model to develop a raising factor to apply to the total counts at the site.

The dynamics of adult populations are being investigated by examining scales from salmon to provide stock descriptions and to advise on the proportion of one-sea winter (1SW, grilse) and multi-sea-winter (MSW) fish in different stocks or populations, and on run-timing. These data will contribute to refined CL for individual rivers. A study on the impact of seal predation on salmon stocks in the Slaney and Moy rivers was completed in 2013.

Why is the project being undertaken?

The project is being undertaken to provide data on the status of salmon stocks in rivers where no direct means of stock assessment is available, and to support reporting to the EU Habitats Directive Article 17 species assessment programme. The additional data will assist the SSCS in refining models used to assess CL attainments annually.

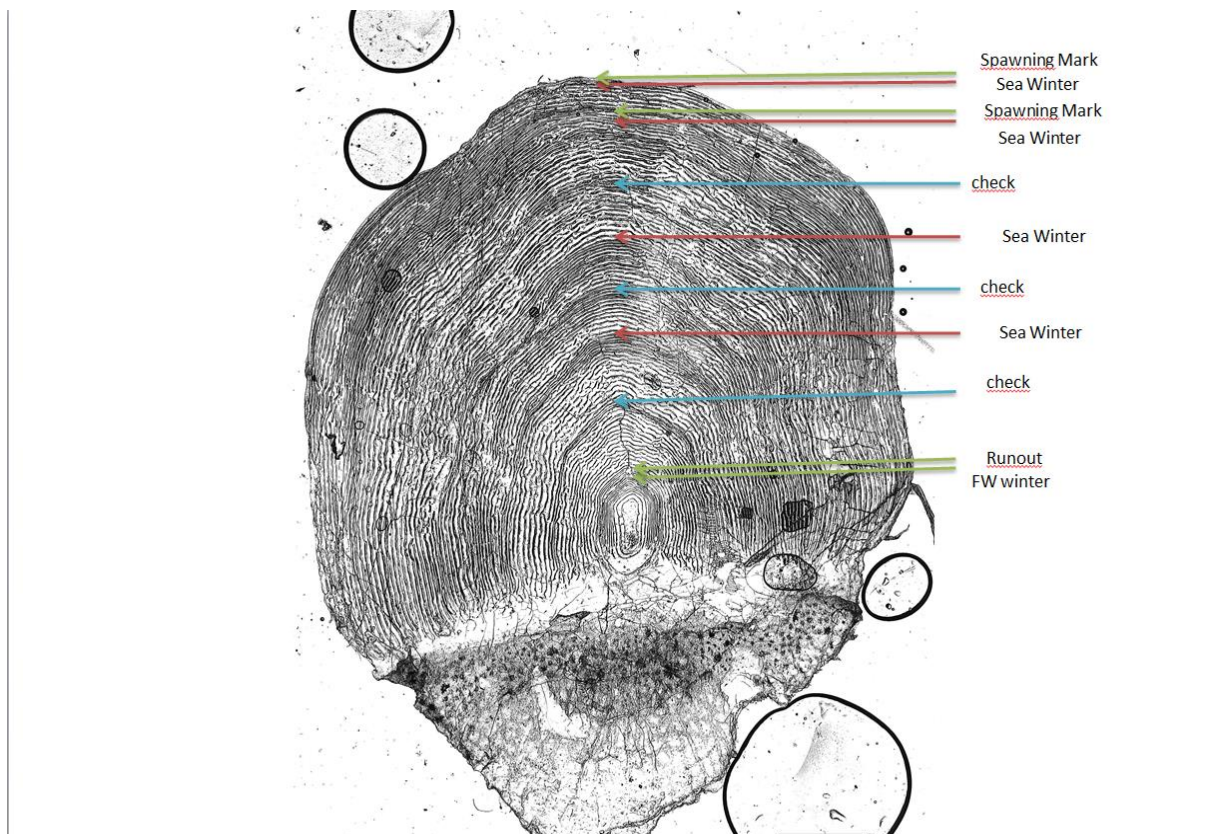


Plate 3 Annotated scale –from a large Atlantic Salmon (length 46 inches) recovered from the river Suir in February 2013. - . This fish spent two years in freshwater before going to sea and then remained at sea for three winters. At the end of the third winter at sea the salmon returned to the river and spawned. The fish then returned to sea and remained for another winter before returning to spawn for a second time. After spawning for a second time, the fish was found dead in February. Many thanks to Peder Fiske and Gunnell Ostborg (NINA) for confirmation of scale ageing. The age determination can be described as 2.3+2SM.

Planned completion date

December 2013

Who will benefit from the project?

The project is designed to provide scientific information on national salmon stocks to determine if stocks are meeting CL. Fishery managers, scientists, local river proprietors and anglers will all benefit from a better understanding of the biology and stock status of salmon nationally.

When will interim / final reports be available?

April 2014

Progress to-date

Catchment-wide electrofishing was completed in 34 catchments in 2013 to assess abundance and distribution of salmon fry, with a total of 787 sites visited. A total of 274

catchment surveys in 127 catchments (5745 site surveys) have been undertaken in the first six years of the programme (2007-2013).

The annual average CW electrofishing catch of salmon fry is re-calculated for each catchment every year. An overall average annual catch of 17 fry has been defined by the SSC as the threshold at which a river may be opened for catch and release in 2013. This threshold applies in the absence of any other information or where information is limited or insufficient. Seven rivers predicted not to have a salmon surplus in 2013 that had an average salmon fry index ≥ 17 over the 2009-2013 period were recommended for opening on a catch and release basis in 2013; this would provide rod catch data for estimation of stock size. The rivers were Owenagarney, Bungosteen, Carrownisky, Owenascaul, Owenwee (Yellow), Milltown (Kerry), Cloonee.

Adult salmon were tagged in the Boyne in summer 2013 and monitored throughout the subsequent period up to early 2014.

Scales were collected from adult salmon from various commercial and angling fisheries in 2013.

Findings of interest

For the 34 salmon catchments surveyed in 2013, the average salmon fry abundance ranged from zero on the Erne, to 33.06 salmon fry on the Cloonee. The Bungosteen, Swilly, Carrownisky, Leannan, Owenwee (Yellow), Castletown, Feale, Owenmore, Erriff and Cloonee all recorded an annual CW average of >17 fry. Salmon fry densities of over 15 fry/min were also recorded on the Clooghnamore, Owenascaul, Owenagarney and Bungosteen catchments.

There was generally good agreement between CW electrofishing surveys and the SSCS scientific assessments of attainment of salmon CL from rod catch or counter data. However, electrofishing results suggested that some rivers (typically those with a rod catch <10) were, very unlikely to be meeting their derived CL.

Results to date indicate that the CW electrofishing technique has good potential for salmon stock assessment. The data collected in the first six years of the project are currently being used to establish meaningful relationships between juvenile abundance and CL. The technique is likely to provide the best estimate of salmon stock status in small rivers where rod catch is low (<10 salmon pa) and cannot be used to estimate stock size currently. CW electrofishing is also important in providing managers with detailed information on salmon fry distribution and abundance. The absence or low density of salmon fry may be related to water quality issues, obstructions, or habitat damage and areas of low abundance can be investigated. These data should be used to target any remediation works that may be required.

In July 2013, 200 salmon were tagged with floy mounted PIT tags as part of the counter efficiency estimation programme. Traditional draft net fishermen, under the supervision of staff from IFI Drogheda, sampled salmon in the tidal portion of the catchment in 2013. Only 1 PIT tagged salmon was detected passing the PIT tag readers at Blackcastle. The exceptionally low water levels and high temperatures in summer 2013 are likely to have influenced fish behavior for the period, resulting in large groups of fish migrating at peak times in autumn, and in consequent losses in tag detections. A full analysis of these data is ongoing; up to five years of data will be required to develop a robust raising factor.

Salmon scales were collected and analyzed for life history information from the commercial fisheries on the Munster Blackwater, Nore and Suir and from the rod

fisheries on the Owenmore river (Connemara) and Sneem river (Co. Kerry). The Munster Blackwater recorded 60% grilse, 37% (MSW) and 3% previous spawners. The river Suir recorded 46% grilse, 49% MSW and 5% previous spawners while the river Nore recorded 35% grilse, 52% MSW and 13% previous spawners. The Owenmore (Ballynahinch river) was dominated by 1SW fish (87%) with 13% MSW and no previous spawners, while the Sneem recorded 53% grilse and 47% MSW.

Next steps

Work will continue in 2014 on the assessment of attainment of salmon conservation limit project as the data are required to provide scientific advice for management.

PROJECT TEAM	Dr Paddy Gargan Dr Willie Roche IFI RBD Staff nationally Mr Tony Holmes (external consultant)
TOTAL BUDGET €	€99,000
FUNDING SOURCE	National Salmon Conservation Fund.
RESOURCES UTILISED	IFI staff, electro-fishing equipment, tagging equipment.
DELIVERABLES	Assessment of salmon stock status in a range of catchments nationally.

Name of project

Celtic Sea Trout Project

Overview

The Celtic Sea Trout Project (CSTP) aims to understand and describe sea trout stocks in the Irish Sea in order to enhance sea trout fisheries and to strengthen their contributions to quality of life, to rural economies and to national biodiversity. This INTERREG IVa funded (Ireland-Wales axis) project investigates the complex freshwater and marine ecology of sea trout and translates it into fishery management and conservation benefits for countries bordering the Irish Sea.

Many sea trout fisheries in rivers entering the Irish Sea are suffering decline; but the pattern is mixed and in most cases the causes of change and thus potential solutions are poorly understood because of a lack of knowledge about some aspects of sea trout biology. Key questions are:

- Where do they go at sea and how are their stocks structured and interlinked?
- What is their marine ecology (feeding, growth, survival and life history variation)?
- What environmental and other pressures are they exposed to?
- How do their life histories (and thus fishery quality) respond to environmental variation?



Plate 4 Sea trout captured during a CSTP trawling survey in the Irish Sea.

Project deliverables

To address these questions the project primarily focused on:

- The genetics and microchemistry of sea trout with a view to developing stock discrimination tools
- The biological characteristics and ecology of sea trout populations in selected systems and in the marine environment to provide baseline data for management
- The potential role of sea trout as an indicator of climate change

These key deliverables were supported by an extensive sampling programme in freshwater and at sea.

Overarching themes were to increase awareness of sea trout generally through public participation and engagement, and to develop a network for long-term collaboration amongst fisheries workers and the users of fisheries across the Irish Sea. A further deliverable included an inventory of freshwater sea trout fisheries around the Irish Sea including catch statistics.

Understanding the ecology of sea trout at sea is a fundamental requirement for fisheries managers in order to deliver effective management and to determine factors that may influence sea trout stocks and their biodiversity. For the first time, fishery owners, managers, anglers and angling clubs will have baseline information on stocks - these data will allow for any future monitoring of change.

Planned completion date and availability of final report

The project management report to INTERREG IVa was completed in 2013. Web-based progress reports (www.celticseatrout.com) have been posted regularly to inform anglers and fisheries managers. The technical report detailing all scientific outputs is due in late 2014.

Status

Each work package has been completed and the final technical report, which will include each work package report, is being compiled.

Genetics and microchemistry studies in the CSTP were complementary and discriminated different populations at river level. Genetically, each river sampled throughout the Irish Sea has a distinct population within nine regional genetic groups. Sea trout from different regions in the Irish Sea were well-mixed, with some long range (up to 300Km) feeding migrations and fish moving both in northerly and southerly directions.

Catch statistics (available from 1994 onwards) showed common trends in each jurisdiction around the Irish Sea, and declines were evident since 1998, with very poor returns in the middle of the past decade. Maiden zero sea winter (OSW) finnock will support future stocks/catches in most sea trout rivers around the UK and form a vital component of almost all Irish stocks.

The marine ecology work package demonstrated considerable regional variation in growth which was linked to temperature and ultimately to food production. The implications of increased temperatures on growth were modeled to provide a basis to understand the potential implications of climate change. Life-histories (LH) vary between regions and rivers and is linked to growth at sea and possibly river size. LH models are likely to offer more realistic and protective management regulations.

CSTP stock discrimination studies served to reveal the Irish Sea as an integrated contiguous ecosystem that supports differing populations of sea trout. One of the fundamental outcomes of the CSTP was to provide baseline data and analysis to support management decisions concerning sea trout in the Irish Sea. The future status and well-being of Irish Sea migratory trout stocks and recreational fisheries depends on sustainable management which requires a consistent integrated management approach to ensure conservation of biodiversity and sustainability of all fisheries.

PROJECT TEAM	Dr Willie Roche, Dr. Paddy Gargan Mr John Coyne
TOTAL BUDGET €	€466,000 (75% funded by funding measure).
FUNDING SOURCE	INTERREG IVa (Ireland-Wales).
RESOURCES UTILISED	IFI staff, angler sampling (rod sampling in river and sea), IFI facilities and equipment.
DELIVERABLES	Fulfillment of project deliverables under INTERREG IVa (Ireland-Wales) requirements.

Name of project

National Bass Programme

Overview

Inland Fisheries Ireland (IFI) is tasked with advising the Minister on policy and national strategies relating to sea angling. Bass is an extremely important and valuable marine sport fish angling species in Ireland.

The National Bass Programme, which commenced in 2012, is a long-term programme designed to monitor bass stocks and to rejuvenate scientific research on bass in Ireland. Data on Irish bass are being collected and analyzed to provide scientific advice for managers in order to facilitate protection and conservation of bass stocks and its habitat.

The steep decline in bass stocks in Ireland in the mid-1970s resulted in a severe deterioration of a renowned bass angling resource and the cessation of the commercial fishery to conserve stocks through the Bass (Conservation of Stocks) Order, 1990. Since that time, the bass angling fishery has also been heavily regulated by the introduction of size and bag limits. Since the introduction of legal protection for bass, it has been regarded solely as an angling species, and is the only marine fish species in Ireland to be managed for angling.

Available indicators show that bass stocks remain depressed around Ireland compared to stock levels in the 1970s. Although stock assessment data are limited, ICES advice recommends a reduction in effort and catch in relevant fisheries divisions around Ireland.



Plate 5 Fishing for Sea Bass in County Kerry.

Project deliverables

The project deliverables based on data mining, medium- and long-term monitoring and sampling programmes are:

- Collation of historical data on bass to inform development of stock indices
- Annual reports of juvenile bass (0-group and older) stock status to establish a juvenile bass index
- Data to identify key juvenile bass habitats
- Annual assessment of the status and age profile of adult bass populations
- Data sets from tracking/tagging to monitor inshore and offshore bass migration patterns
- Data sets from tracking and modelling to identify potential bass spawning grounds
- Development and evaluation of microchemical analyses of bass otoliths to assess its application to habitat utilisation by juvenile and adult bass
- Increased understanding of the ecology and biology of bass in Irish waters

This project, which will be reviewed in 2016, intends to establish repeatable sampling programmes targeting key life stages providing time-series data for stock assessments.

Planned completion date and availability of final report

This is an ongoing long-term programme which will be reviewed in 2016. The first interim report will be available in the Q4 2014 and include work completed in 2013 and 2014.

Status

Available historical data from previous bass surveys undertaken by IFI (and its predecessors) and associates were collated and mapped. Sites which previously recorded juvenile bass were identified and nine sites were sampled as potential juvenile bass habitats in 2013. Three of these sites returned significant numbers of juvenile bass. When compared to previous juvenile bass surveys, the small numbers of bass encountered suggest that bass spawned in 2013 are unlikely to contribute in large numbers to the bass stock as adults. Samples from these surveys were used to test the viability of using microchemical analysis of bass otoliths as a tool for assigning adult bass to their pre-adult feeding estuary. Preliminary results are encouraging and future studies aim to consolidate the methodology and the baseline.

Extensive engagement with bass anglers has resulted in the establishment of a country-wide scale collection programme. Length, age and growth data have provided profiles of bass in Ireland in 2013 and a database has been developed detailing the age profile, growth and status of the bass population around the Irish coast. Scale samples of 314 adult bass were provided by anglers in six counties. Cork, Wexford and Waterford were the most prolific locations, contributing 85% of the scales combined. Bass ranged in age from 1-17 years old and 2002 and 2007 were the most successful brood years; more than 40% of the sampled fish were spawned in these two years. A voluntary bass logbook scheme has been initiated for anglers to document catch and effort in the recreational fishery. Preliminary results from logbook returns indicate that the majority of bass caught were between 2-4lbs (0.9-1.8 kg). Only 5% of bass caught were retained, revealing a high level of catch and release amongst those bass anglers that submitted a catch return.

PROJECT TEAM	Dr. Willie Roche Dr. Ciara Wogerbauer Mr Glen Wightman
TOTAL BUDGET €	€20,000
FUNDING SOURCE	IFI Funded.
RESOURCES UTILISED	Angler inputs and IFI staff and resources.
DELIVERABLES	Reports, data and advice on the status and behavior of sea bass.

Name of project

Environmental River Enhancement Programme (EREP)

Overview

The Environmental River Enhancement Programme (EREP) project aims to undertake a programme of capital enhancement works and of enhanced maintenance on Office of Public Works (OPW) channels over a second 5 year period (2013 to 2018). The project will also report on the impacts of these works on river biodiversity and hydromorphology. The EREP team will work with OPW staff throughout the project to identify, develop and implement environmentally-friendly drainage maintenance.



Plate 6 Capital works on the River Boyne, near Trim, Co. Meath.

Project deliverables

- Enhancement design plans and walk-over reports for all channels identified for EREP
- Provide an EREP training programme to OPW staff
- Carry out RHAT assessments
- Undertake Biodiversity Monitoring
- Produce an EREP information leaflet

Status

In 2013, IFI and OPW commenced a second five-year EREP programme with the same objectives as those outlined above. This programme has continued through 2014. Essentially, the current programme will learn from and build on the previous one. A number of scientific publications are being prepared on various aspects of the 2008–2012 programme.

PROJECT TEAM	Dr Martin O’Grady Dr Jimmy King Dr Karen Delanty
TOTAL BUDGET €	€355,000
FUNDING SOURCE	Office of Public Works.
RESOURCES UTILISED	IFI resources.
DELIVERABLES	Development and maintenance plans, training, surveys, data, analysis and reports.

Name of project

Brown Trout Genetic Studies

Overview

Three major projects are being planned in this area: the Moy Catchment, the central Shannon basin (all rivers and major lakes from Carrick-on-Shannon downstream to the confluence of the river Suck), and a detailed study of the genetics of trout stocks in the Liffey and its two tributaries, the Dodder and Tolka. The genetics of the trout stocks in the lower Shannon have been investigated already and a final report is expected next year.



Plate 7 Wild brown trout spawning.

Project deliverables

- An understanding of the population dynamics of trout stocks in all three areas
- Information on the origin of adult trout stocks in the Shannon Loughs' Derravaragh and Ree, and the extent to which "middle and lower" Shannon trout stocks may be integrated
- The Moy data base will provide invaluable data on the origins of adult trout stocks in Loughs' Conn and Cullin, and information on the contribution of the various trout stocks in the catchment to the sea trout population
- Data from the Dodder will help define the extent to which man-made barriers that are impassible to trout have interfered with the genetics of stocks after several hundred years

PROJECT TEAM	Dr Martin O'Grady Dr Karen Delanty
TOTAL BUDGET €	€90,000
FUNDING SOURCE	IFI and numerous partners including Intel Ireland, Dublin, city Council, all angling clubs on the Liffey and Dodder and the Lough Conn Anglers. Many anglers in all catchments also assisted the project by collecting scales from adult trout.
RESOURCES UTILISED	Genetic analysis will be carried out under the direction of Professor Paulo Prodohl, Queen's University, Belfast.
DELIVERABLES	A better understanding of the dynamics of trout stocks across some of our bigger catchments. This will support better informed management decisions.

Name of project

Water Framework Directive (WFD) Surveillance Monitoring of Fish Stocks in Lakes, Rivers and Transitional waters

Remit of project

The Water Framework Directive states that monitoring of a variety of biological elements (including fish) is undertaken in order to assign an overall ecological status to a water body. Inland Fisheries Ireland has been assigned the responsibility by the Environmental Protection Agency (EPA) to deliver the fish monitoring requirements of the WFD. The fish monitoring programme has been conducted annually since 2007 at specified locations. This programme is providing information on the ecological status of fish species present in each waterbody as well as information on their abundance, growth and population demographics.

Why is the project being undertaken?

Each EU Member State is required to implement restorative measures to preserve those water bodies that are currently in High or Good ecological status and to restore those water bodies that are currently impaired, in order that they achieve at least Good ecological status by 2015. In order to achieve this, each Member State must assess the current ecological status (High, Good, Moderate, Poor or Bad) of surface waters through monitoring of a variety of biological and physico-chemical elements. Ongoing monitoring of these water bodies can then track the effectiveness of corrective measures established to restore those not meeting the requirement of Good ecological status.

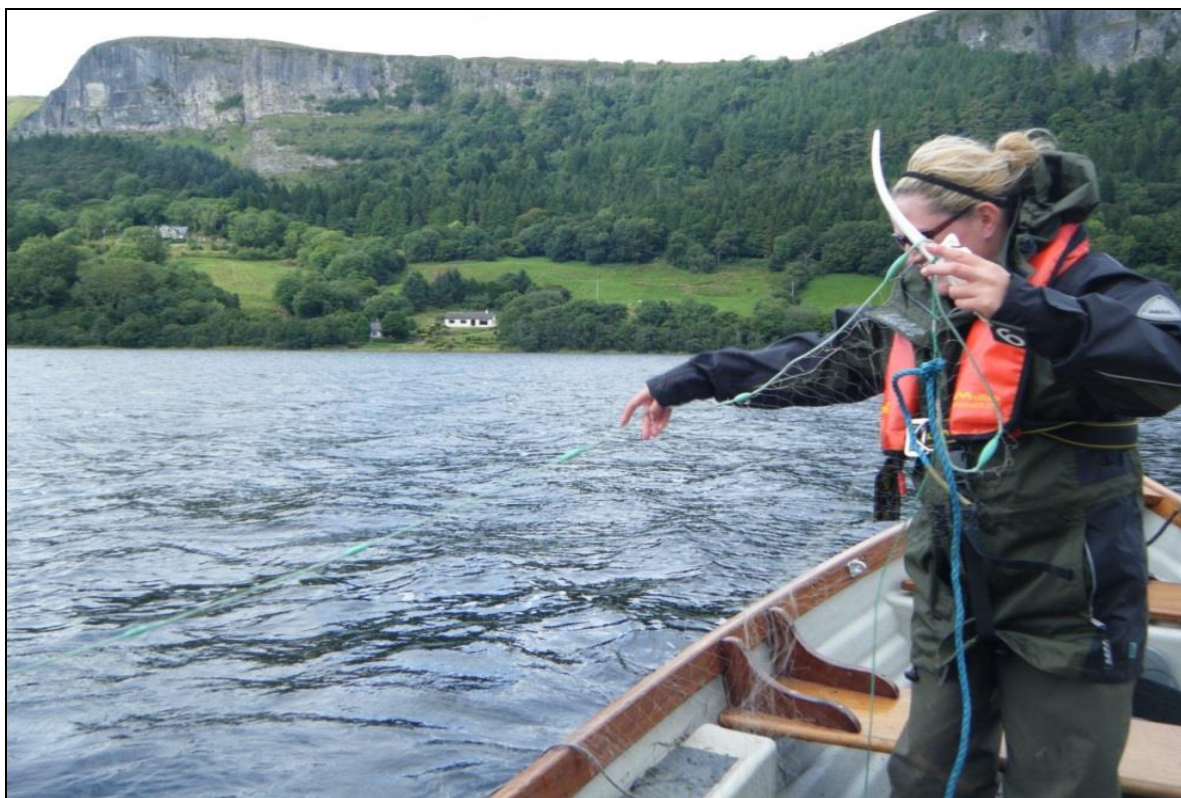


Plate 8 Deploying a monofilament multi-mesh gill net on Glencar Lake, Co. Sligo, August 2013.

Planned completion date

The WFD is an ongoing legislative requirement under which all matters relating to the quality, quantity and ecology of freshwater, transitional waters and inshore marine waters will be protected and managed. The WFD monitoring programme operates in three-year phases (2007-2009, 2010-2012 and 2013-2015)..

Who will benefit from the project?

The data collected to date for the WFD fish monitoring programme not only fulfills legislative requirements but provides an invaluable source of information on fish species distribution and abundance for decision makers, angling clubs, fishery managers and owners and other interested parties.

When will interim/final reports be available?

Interim (preliminary) reports on each water body are published on the dedicated WFD fish website (www.wfdfish.ie) throughout the monitoring season (June–October). These reports are replaced regularly with more detailed reports on each water body once all the relevant fish data has been processed. Final reports for all water bodies surveyed during 2013 were published on the WFD fish website in mid-2014. A comprehensive summary report for the 2013 surveillance monitoring programme is also available on the website. A report on the ecological status of fish in each waterbody is provided to the EPA annually.



Plate 9 Releasing a brown trout on Kylemore Lake, Co. Galway, August 2013.

Progress to-date

The first three-year surveillance monitoring cycle (2007–2009) has been completed, with a total of 279 water bodies being surveyed, encompassing 70 lakes, 137 river sites and 72 transitional water bodies. More than 70 fish species and 150,000 individual fish were recorded.

The second three-year surveillance monitoring cycle (2010–2012) has also been completed, with a total of 78 lakes, 30 transitional waters and 166 river sites being surveyed (274 water bodies). More than 111,000 individual fish were recorded.

The first year of the third three year cycle began in 2013 with another extensive surveillance monitoring programme; 63 river sites, 24 lakes and 10 transitional water bodies were successfully surveyed throughout the country. All fish have been identified, counted and a representative sub-sample has been measured, weighed and aged. A further subsample of fish was retained for laboratory analysis of stomach contents, sex and parasitism.

New fish classification tools have been developed for rivers, lakes and transitional waters and these have been successfully inter-calibrated in a cross-Europe exercise.

To complement the outputs from the surveillance monitoring and classification tools, a simple fish kill metric has been introduced to classify monitored and unmonitored water bodies. The general principle of this metric is that if a fish kill occurs in a water body, its status will be downgraded for that year (and measures taken to prevent a reoccurrence), however the downgrade can be for greater than one year with investigative monitoring taking place the following (and subsequent) years to assess its recovery. Electrofishing surveys were conducted on sites on the River Dodder, White River, Vartry River and Kiltha River to assess their on-going recovery after fish kills during 2012 and 2013. A comprehensive report of the findings will be available in due course.



Plate 10 Electric-fishing on the Cumberagh River, Co. Kerry, July 2013.

Findings of interest

Twenty-four lakes were surveyed during 2013, with a total of 17 fish species (sea trout are included as a separate 'variety' of trout) and one type of hybrid being recorded. Eel was the most common fish species recorded, occurring in 20 out of the 24 lakes surveyed (83.3%). This was followed by brown trout, perch, pike and roach, which were present in 70.8%, 66.6%, 41.7% and 33.3% of lakes respectively. In general, salmonids were the dominant species in the north-west and west areas of the country. Sea trout were captured in four lakes in the west and north-west and Arctic char were recorded in three lakes in the west and north-west. No Arctic char (a salmonid species that is classified in the Irish Red Data List as vulnerable (King *et al.*, 2011)) were recorded in Ardderry Lake in the 2013 survey and the populations of perch had increased since the previous survey. Arctic char abundance in Lough Shindilla had also decreased dramatically in the 2013 survey alongside an increase in the perch population. The fish populations in these lakes need to be closely monitored as the Arctic char is very sensitive to anthropogenic impacts and to date over 30% of Irish populations have become extinct.

A total of 16 fish species (sea trout are included as a separate 'variety' of trout) and one type of hybrid (roach x bream) were recorded in the 63 river waterbodies surveyed during 2013. Brown trout was the most common fish species recorded, being present in 93.7% of sites surveyed, followed by European eel (69.8%), salmon (61.9%), three-spined stickleback (50.8%), stone loach (50.8%) and lamprey sp. (49.2%).

A total of 39 fish species (sea trout are included as a separate 'variety' of trout) were recorded across the ten transitional water bodies surveyed during 2013. The greatest number of species recorded in any single water body was 22, captured in the Barrow-Suir-Nore estuary waterbody, while the smallest number (seven) was recorded in both the Upper Barrow Estuary and Lough Gill. Sand goby was the most commonly encountered species, recorded in all ten water bodies, while European eel and flounder were recorded in nine sites each. Smelt were recorded in eight water bodies, while Twaite shad (EU Habitats Directive (92/43/EEC) Annex II and V species and listed in the Irish Red List as vulnerable (King *et al.*, 2011)) were recorded in six water bodies. Important angling species documented during these surveys included brown trout, cod, European sea bass, salmon and sea trout.

All lakes, rivers and transitional water bodies surveyed during 2013 were assigned a draft ecological status based on the fish populations present using the Fish in Lakes tool (FIL2), the rivers tool ('FSC2 Ireland') and the transitional waters tool (Transitional Fish Classification Index – TFCI). Six lakes were classified as High ecological status, eight were classified as Good, one was classified as Moderate, six were classified as Poor and two were classified as Bad. Three river sites were classified as Poor, 28 were classified as Moderate, 26 were classified as Good and 6 were classified as High. Four transitional water bodies were classified as Moderate and six as Good.

Next steps

Detailed reports on each water body surveyed during 2013 and a comprehensive summary report on the 2013 surveillance monitoring programme is available on the WFD fish website (www.wfdfish.ie). Fieldwork for the 2014 surveillance monitoring programme is underway and will be conducted between June and October 2014 with fish processing and data analysis progressing over the winter months. Detailed reports on each water body surveyed in 2014 will be available in Q2 of 2015 and a comprehensive summary report on the 2014 surveillance monitoring programme will be available in Q3.

PROJECT TEAM	<p>Dr Fiona Kelly (Project Director) Ms Lynda Connor (Project Manager) Dr Ronan Matson Mr Rory Feeney Ms Emma Morrissey Mr John Coyne Mr Kieran Rocks Mr Johannes Bulfin (June 13 to Dec 13) Ms Laura Walsh (June 13 to Dec 13) Ms Karen Kelly (June 13 to Dec 13) Mr John Finn (June 13 to Dec 13) Ms Roisin O'Callaghan (June 13 to Dec 13)</p>
TOTAL BUDGET €	Funding received for 2013 was €0.5 million
FUNDING SOURCE	Funding for 2013 was provided by the Department of Communications, Energy and Natural Resources.
RESOURCES UTILISED	Six full time staff and five temporary staff were employed on the project throughout 2013. Survey work was conducted in conjunction with further full time and temporary staff employed in regional IFI offices.
DELIVERABLES	<p>Dedicated WFD fish website (www.wfdfish.ie) reporting all findings. Weekly preliminary reports throughout the field season circulated to regional IFI staff as well as being placed on the dedicated WFD fish website. Detailed reports on each water body surveyed circulated to regional IFI staff as well as being placed on the dedicated WFD fish website. Final summary report for 2013 surveillance monitoring programme available in 2014. GIS database. GIS Map viewer on website updated. Ecological status for rivers, lakes and transitional waters delivered to the EPA. Provide support to National Eel Management Plan. Provide support to IFIs Conservation fish and Habitats Directive programme Provide support to other projects as deemed necessary.</p>



Plate 11 Seine netting on the Upper Nore estuary, Inistioge, Co. Kilkenny, October 2013.

Name of project

Fisheries Development Programme for Waterways Ireland

Overview

IFI are contracted by Waterways Ireland to provide fisheries management, aquatic plant management and Water Framework Directive (WFD) monitoring on the Royal and Grand Canals, the Barrow Navigation and the Shannon-Erne Waterway.

The programme is conducted under the following broad headings:

- Fisheries and Environment Enhancement.
- Aquatic and Riparian Plant Management and Invasive Species Control.
- Water Quality Monitoring and Pollution Mitigation

The programme reflects the statutory obligations of Waterways Ireland and its objective of providing a quality waterways habitat commensurate with its use by a wide diversity of user groups. It further recognizes the fisheries management and environmental needs of these watercourses. In addition, the programme pays due cognizance to the obligations imposed by the Water Framework Directive (2000/60/EC).



Plate 12 Electrofishing on the Naas and Corbally Branch, south of Naas Harbour in 2013.



Plate 13 Assessing dredged material for the presence of Asian clam on the Barrow Navigation at Levittstown.

Project deliverables

As part of WFD compliance monitoring of the Royal and Grand Canals and the canalised section of the Shannon-Erne Waterway, IFI sampled 44 sites for physico-chemistry and aquatic macrophytes in 2013. In general, the ecological quality of the waterway network was good and continued to show compliance with relevant standards.

IFI also maintained vigilance of a number of feeder streams to the canals. These feeders can be a source of intermittent contamination and their monitoring is an important tool in identifying pollution sources to the main channels.

The Royal Canal at Kilcock Harbour experienced sewage contamination from a culverted surface water drain in 2012. Following repair works on the foul and surface water network by Kildare County Council, IFI continued monitoring of the drain and harbour in 2013. While conditions improved over the summer months, a high *Escherichia coli* (*E. coli*) count in the drain following heavy rainfall in August indicated on-going problems at this location. Discussions with Kildare County Council to rectify the matter are ongoing.

The Grand Canal Basin in Dublin is a recreational amenity used by the public for a number of water based activities. The inner Basin occasionally receives contaminated water from a Dublin City Council urban wastewater outfall. A programme of bi-monthly coliform sampling was implemented in June to monitor water quality in the inner and outer Basin.

Aquatic plant management and invasive species surveys were conducted along the entire length of the Royal and Grand Canals. Surveillance monitoring for Asian clam (*Corbicula fluminea*) was carried out on those westerly reaches of the Royal and Grand Canals nearest the River Shannon, and at designated sections of the Barrow Navigation and Shannon-Erne Waterway. To date, this species has not been recorded in these waters.

Further control measures were carried out on the section of the Grand Canal where control of the invasive plant, New Zealand Pigmyweed (*Crassula helmsii*) has been conducted. Biomass of the plant (which had exhibited some minor re-growth in 2012) was further reduced by these operations. Monitoring will continue throughout 2014.

Treatment programmes for a variety of invasive aquatic and riparian plant species (e.g. Japanese Knotweed and Himalayan Balsam) also continued. Biosecurity surrounding amenity use remains a priority, and further successful measures were demonstrated and implemented at several angling events.

Results of fish stock assessments indicate that stocks remain generally healthy. Geographical differences in fish community structure, identified in previous surveys remain evident, with excellent stocks of bream and roach stocks recorded from sections of the Grand and Royal Canals respectively.

Fish stock enhancement operations were targeted at those urban fisheries which hosted angling competitions during the year. To mitigate the impact of routine maintenance and in stream works, fish were relocated at four sites. Where encountered, and under licence to NPWS, crayfish were also removed to safety. In addition to directly protecting resident fish shoals, these events also enable IFI staff to examine drained waterways for the presence of unusual invasive or problematic plant and animal species.

Planned completion date and availability of final report

The project is ongoing. A report detailing activities for 2013 has been completed.

Status

The project is ongoing in 2014.

PROJECT TEAM	Mr Paul McLoone Dr Joe Caffrey
TOTAL BUDGET €	€230,874
FUNDING SOURCE	Waterways Ireland.
RESOURCES UTILISED	IFI staff, Waterways Ireland staff.
DELIVERABLES	Reports, data and specific management advice to Waterways Ireland, Inland Fisheries Ireland, environmental consultants and resource users.

Name of project

Control of Aquatic Invasive Species and Restoration of Natural Communities in Ireland

Remit of project

The CAISIE Project (Control of Aquatic Invasive Species and Restoration of Natural Communities in Ireland) was tasked with reducing biodiversity loss in Ireland by preventing further impacts on native communities from high impact aquatic and riparian invasive species. The project (January 2009-January 2013) focused on (1) Lough Corrib, and (2) the Grand Canal and Barrow Navigation. The CAISIE project was funded by the EU LIFE+ programme with co-financing from the National Parks and Wildlife Service (NPWS).

In association with IFI and the European Inland Fisheries and Aquaculture Advisory Commission (EIFAAC), the CAISIE project, co-hosted The 'Freshwater Invasives - Networking for Strategy' (FINS) Conference in Galway in April 2013.

Why is the project being undertaken?

Aquatic invasive species (AIS) are internationally recognised as a principal threat to native inland water communities and ecosystems. The ecological impacts of AIS can be mediated by competitively excluding or out-competing the less robust native species, by preying on native species or by altering the natural aquatic or riparian habitat in which they reside. These species pose a growing threat to Ireland's unique biodiversity and to economic interests such as fisheries, tourism and agriculture. The CAISIE project aimed to control high impact invasive species (notably the Curly-leaved waterweed *Lagarosiphon major* in Lough Corrib and a range of AIS in the Grand Canal and Barrow Navigation) and prevent their further impacts through the development and demonstration of effective control methods, a programme of stakeholder engagement and awareness-raising, and policy development and dissemination.



Plate 14 *Lagarosiphon major* in Lough Corrib.

Planned completion date

The CAISIE Project concluded in January 2013. The Final Report was submitted to the European Commission in June 2013. The FINS Conference took place from the 9th to 11th of April 2013.

Who will benefit from the project?

From its inception, the CAISIE Project has been the lead mechanism to manage the threat from AIS in Ireland. LIFE+ funding has facilitated the development of a wide range of control and stakeholder initiatives, which will provide enduring and long-term benefits within the project areas, in Ireland and further afield. The project has facilitated the development of specialist scientific, management and control expertise to continue to address the threat posed by AIS in Ireland and to implement appropriate measures to reduce their future socio-economic impacts. This expertise provides a number of long-term benefits including the ability to quickly respond to new instances of AIS before they establish and cause negative socio-economic impacts or to effectively manage existing issues to limit these impacts. The project has also increased awareness of AIS, which can ultimately limit the introduction and spread of these species in Ireland and the concomitant socio-economic impacts that can occur. The international FINS Conference (co-sponsored by CAISIE, IFI and EIFAAC) proved to be highly successful in drawing international policy makers, customs officials, AIS managers, State bodies and academics together in order to identify the major challenges in invasive species management in Europe and inform policy makers in this regard.



Plate 15 *Lagarosiphon major* survey in Lough Corrib – September 2013.

When will interim/final reports be available?

The CAISIE Project Final Report is available on the project website www.caisie.ie. The CAISIE Project Layman's Report is also available on this website. A publication from the FINS Conference will be available in early 2014.

Progress to-date

Lough Corrib

- Over 90% of the original 92 hectare infestation of Curly-leaved waterweed in Lough Corrib has been treated
- Native species have re-established in treated areas after weed control
- Previously infested areas have been re-opened for angling and boating
- A 'rapid reaction' capability to quickly respond to new threats of AIS in Lough Corrib has been implemented
- Weed control operations have prevented the spread of Curly-leaved waterweed to the lower section of Lough Corrib
- New control methods have been developed to successfully treat Curly-leaved waterweed in Lough Corrib. Jute matting has since been used in other weed infested waters in Ireland and internationally
- Considerable progress has been made to identify a suitable biological agent to control Curly-leaved waterweed
- New survey methods have been developed to monitor the distribution and extent of colonisation of Curly-leaved waterweed and assess the efficacy of the control measures employed to treat it
- A herbarium of indigenous macrophyte flora of Lough Corrib has been prepared

Grand Canal and Barrow Navigation

- The distribution and abundance of AIS in the Grand Canal and Barrow Navigation have been estimated
- New control methods have been successfully developed or adapted to treat a range of AIS in the Grand Canal and Barrow Navigation
- All sites with Giant hogweed, Japanese knotweed, New Zealand pigmyweed and Nuttall's pondweed on the Grand Canal and Barrow Navigation have been treated
- Himalayan balsam has been contained in the Barrow Navigation below Athy
- Dace have been prevented from entering the main Grand Canal channel
- Native species have re-established in treated areas

Vectors and Pathways

- A detailed appraisal of AIS vectors and pathways has increased the understanding of how AIS are introduced into and spread in Irish waterways. This knowledge has supported the development of targeted initiatives to limit further introduction or spread

Stakeholder engagement and Biosecurity

- CAISIE drove AIS Biosecurity Policy in Ireland and within IFI. The CAISIE Project has been integral to the development of AIS biosecurity initiatives in Ireland and in engaging with stakeholders
- A range of invasive species education and awareness material has been produced and circulated including biosecurity guidelines for various stakeholder groups
- Approximately 70 events to promote biosecurity have been attended and the project has successfully encouraged the implementation of AIS biosecurity among stakeholders
- CAISIE has been integral to the mandatory disinfection of angling gear at two international angling competitions

- A suite of practical tools for stakeholders (including IFI and sister agencies) have been developed to tackle any future invasions of AIS. This includes guidelines on effective measures to control AIS

Findings of interest

See above.

Next steps

'After LIFE' Conservation and Communication plans have been produced to set out key aspects of the CAISIE project that will be continued after the project concluded. Both are available to view on the project website www.caisie.ie.

PROJECT TEAM	Dr Joe Caffrey (Project Leader) Mr Bryan Deegan (Project Manager) Dr Michael Millane (Research Officer) Dr Louise Scally (Consultant) Ms Helen Moran (Research Assistant)
TOTAL BUDGET €	€1.533.466
FUNDING SOURCE	EC LIFE+ and National Parks and Wildlife Service.
RESOURCES UTILISED	IFI, MERC Consultants, Waterways Ireland and Geo-mara.
DELIVERABLES	Contribute to the halting of biodiversity loss in Ireland by preventing further impacts on native biodiversity from high impact aquatic invasive species, through the development and demonstration of effective control methods, a programme of stakeholder engagement and awareness raising, and policy development and dissemination.



Plate 16 Removal of *Lagarosiphon major* from Lough Corrib.

Name of project

Habitats Directive

Remit of project

The remit of the project is to examine the status of Habitats Directive (HD) 'conservation fish species' i.e. shads, lamprey species, pollan, char and smelt, in Irish waters. The shads, lamprey species, pollan and Atlantic Salmon are listed in the EU Habitats Directive.

Why is the project being undertaken?

Ireland is legally obliged to report in a six-year cycle on the status of species listed in the EU HD (Article 17). The Minister of CENR, as the inland fisheries minister, is charged with this responsibility for the HD fish species - as reinforced in Statutory Instrument 477 of 2011. IFI carries out this function for the Minister.

Planned completion date

The final year of the current HD reporting cycle was 2012, with a reporting date to the EU for June 2013. IFI worked closely with the NPWS to successfully complete its Article 17 reports on time. These reports were transmitted to the EU by NPWS. The next six-year cycle of monitoring and status assessment covers the 2013–2018 period and sampling for this period commenced in 2013.



Plate 17 Recently-transformed lamprey from River Suir at Cahir, Co. Tipperary.

Who will benefit from the project?

New knowledge on the status and distribution of HD species will be important in identifying any necessary conservation or infrastructural measures required for the species survival. Some of these measures will be consistent with requirements of the Water Framework Directive (WFD) or of measures in the National Biodiversity Plan. Of particular interest is the issue of artificial barriers to fish passage and the conservation implications for migratory fish species such as Atlantic Salmon and the sea- and river lamprey.

When will interim / final reports be available?

Interim reports are produced annually on work carried out in that year. These are available for the five years 2009–2013 inclusive on the IFI website at <http://www.fisheriesireland.ie/Projects/habitats-directive-and-red-data-book-fish-species.html>

The Article 17 documentation summary is available on-line from NPWS http://www.npws.ie/publications/euconservationstatus/NPWS_2007_Conservation_Status_Report.pdf

Progress to-date

Monitoring and surveillance of HD fish species is enshrined in the recently-enacted Statutory Instrument 477 of 2011, and so monitoring will be ongoing. Given the tenuous or uncertain status of several species, the development of statistically-meaningful and repeatable survey techniques is an important requisite.

The team continues to work with IFI's WFD team in regard to pollan status in the large Shannon lakes, using hydro-acoustic and netting techniques. Both Lough Ree and Lough Derg (twice) were surveyed in 2009-2012. Additional survey work was undertaken in L. Ree in autumn 2013.

The survey team has developed a sampling technique to assess spawning success and recruitment of post-larval and juvenile shad in the SAC channels of the south-east. Further robustness-testing of this strategy will be undertaken annually in the 2013-2018 period. The technique will also be trialled for Killarney shad. In 2013, IFI and the Northern Ireland AgriFood and Biosciences Institute (AFBI) conducted partially successful trials of the technique on post-larval pollan in Lough Ree.

Juvenile lamprey status was assessed in 19 catchments in 2009-2012. Assessed catchments included the Foyle system (surveyed jointly with the Loughs Agency) and a series of larger systems such as the Suck, Liffey and Lee. This dataset adds to that commissioned by the NPWS in 2003-2006 to provide a broad picture of juvenile lamprey status from 2003-2012. These data will provide a baseline against which forthcoming 2013-2018 surveillance programme data can be compared.

The survey team compiled a data set on brook lamprey spawning activity and habitat attributes at spawning locations and a scientific publication providing a broad overview of the Irish situation was published in 2013.

Findings of interest

A telemetry trial using radio tagged shad and submerged listening stations, commenced in the Barrow estuary in 2012 and was continued in 2013. Initial assessment of results points to this programme being a valuable source of information on habitat-use, residency and movement of adult shad during the spawning period. It is proposed that additional trials be undertaken in other SAC estuaries during 2013-2018.

Float-over surveys of Sea Lamprey spawning activity and habitat indicated adequate spawning habitat in the majority of surveyed SAC main stem channels. However, redd counts were low in the majority of cases. Repeat surveys on the Suir and Nore in 2013 yielded low levels of spawning when compared to previous float-over surveys. While adult Sea Lamprey have been observed and spawning sites located in the main stems of some large rivers, the occurrence of Sea Lamprey amocoetes in catchment-wide surveys was very low.

Next steps

A six-year work programme (2013-2018) commenced in 2013. This programme will use standardized survey techniques and appropriate habitat units, considering each relevant taxonomic group.

PROJECT TEAM	Dr James King Ms Nicola O' Gorman Dr Sean Rooney Mr Daniel Cierpial
TOTAL BUDGET €	€200,000
FUNDING SOURCE	Exchequer-funded National Programme.
RESOURCES UTILISED	IFI R&D resources; Access to local IFI staff and logistics in variety of River Basin Districts; synergy with IFI's Water Framework Directive survey team; networking with NPWS, NIEA and AFBI NI.

Name of project

MulkearLIFE Project

Overview

MulkearLIFE (www.mulkearlifeproject.com) is a five-year integrated catchment management project with a budget of €1.74 million, funded under the European Commission LIFE+ Nature programme. The project will contribute to restoration of part of the Lower Shannon Special Area of Conservation (SAC, Mulkear River catchment) for Atlantic Salmon, Sea Lamprey and European Otter. Inland Fisheries Ireland is the coordinating project partner together with the Office of Public Works and Limerick County Council. Additional funding support comes from National Parks & Wildlife Service. Other supporters include Coillte, ESB, Department of Agriculture, Teagasc, IFA and ICMSA. MulkearLIFE is one of the first and most important integrated catchment management projects in Ireland and is a flagship EC LIFE Nature project – one of only two catchment based projects awarded funding in Ireland in the last 20 years.

The Mulkear, together with its principal tributaries (Dead, Bilboa and Newport rivers), drains a catchment area of approximately 650 km² spanning counties Limerick and Tipperary. The Mulkear River is regarded as one of the top five salmon rivers in Ireland when its relative size is considered, producing a significant annual salmon run. It also holds a nationally important population of Sea Lamprey. European Otter are known to be widespread in the catchment. The main project objective is to restore, through in-stream rehabilitation works, degraded habitats along stretches of the Mulkear River and its principal tributaries.

Project deliverables

- Enhancement of the populations of Atlantic Salmon, Sea Lamprey and Otters in the Mulkear Catchment
- Development of practical, costed and transferable management prescriptions for habitat rehabilitation for Atlantic Salmon, Sea Lamprey and European otters for other Natura 2000 sites
- Greater awareness & understanding of issues affecting the SAC and how to manage the catchment

Planned completion date and availability of final report

MulkearLIFE was granted a project modification by the EC in late 2013, which extended the project timeframe by 12 months. The project will now end on the 31st December 2014. IFI will be obliged to submit a final report to the EU by the 1st April 2015. The project plan and IFI requirements ensure the delivery of detailed reports throughout the lifecycle of the project.

Status

Very considerable progress was achieved in 2013 in enhancing habitat to support populations of Atlantic Salmon and Sea Lamprey through in-stream rehabilitation work, bank protection and bank stabilization work and in addressing obstacles to the annual adult Sea Lamprey river upstream migration for spawning and recruitment. One of the many highlights of 2013 was the granting by the Chartered Institution of Water and Environmental Management (CIWEM) of its Environment Award for 2013 to MulkearLIFE. This award acknowledged the contribution of MulkearLIFE in bringing community and

government together to plan, manage and enhance the conservation status of the Lower Shannon SAC.

Key achievements to-date

- Installed an additional 11 rubble mats on the Mulkear River, utilising over 1,750 tonne of rock, helping to enhance habitat and food supply for Atlantic Salmon improving in-stream and riparian biodiversity
- Strategically placed over 320 random boulders on the Clare/Annagh, Killeenagarraiff and Newport rivers improving in-stream biodiversity
- Achieved successful passage of Sea Lamprey on two fish passes specifically designed to assist Sea Lamprey ascend major barriers on the Lower Mulkear River at Annacotty
- Partially removed a large section of Ballyclogh weir on the Lower Mulkear River to provide permanent passage for Sea Lamprey (and Atlantic Salmon). This work has also addressed a major concern regarding unauthorised fishing activity at this location in that Atlantic Salmon are no longer held up at this barrier. The work has created almost 1km of excellent pool and riffle habitat immediately upstream of the weir but more importantly has opened up an additional 184km of Sea Lamprey habitat
- Treated over 200 km of river channel (riparian habitat) to control non-native invasive plant species (with focus on Giant Hogweed and Knotweed species) and manually removed other invasive species (Himalayan Balsam and Pheasant Berry) from High Nature Value sites in the catchment
- Installed an additional 4 artificial otter holts in areas of low otter density and improved otter habitat through the planting of thousands of trees
- Worked directly with farmers on 12 'pilot farm sites' to address local water quality concerns by restricting livestock from watercourses and installing alternative watering solutions. Undertook training sessions and two separate 'demo days' for Teagasc / IFI staff and local farmers
- The Mulkear Conservation Volunteers undertook practical, river-based, conservation activities linked to MulkearLIFE's work programme. Work was carried out at 11 different sites amounting to over 130 unit days
- The project's Environmental Education Programme undertook additional engagements and over 65 classroom engagements and separate half-day river based field trips, in which over 1,700 schoolchildren have participated. Separately field-trips and training courses have been provided for over 270 adults (and children).

PROJECT TEAM	Mr. Ruairí Ó Conchúir (Project Manager) Mr Glen Wightman (Research Officer)
TOTAL BUDGET €	€1,740,818
FUNDING SOURCE	Inland Fisheries Ireland, NPWS and EU LIFE+ and (Associate Beneficiaries).
RESOURCES UTILISED	Staff and resources from IFI, Limerick County Council, North & South Tipperary Councils & the Office of Public Works.
DELIVERABLES	



Plate 18 Sea Lamprey redd.



Plate 19 Construction of Rubble Mat – August 2013.



Plate 20 Clare Glens, Mulkear Catchment 2013.

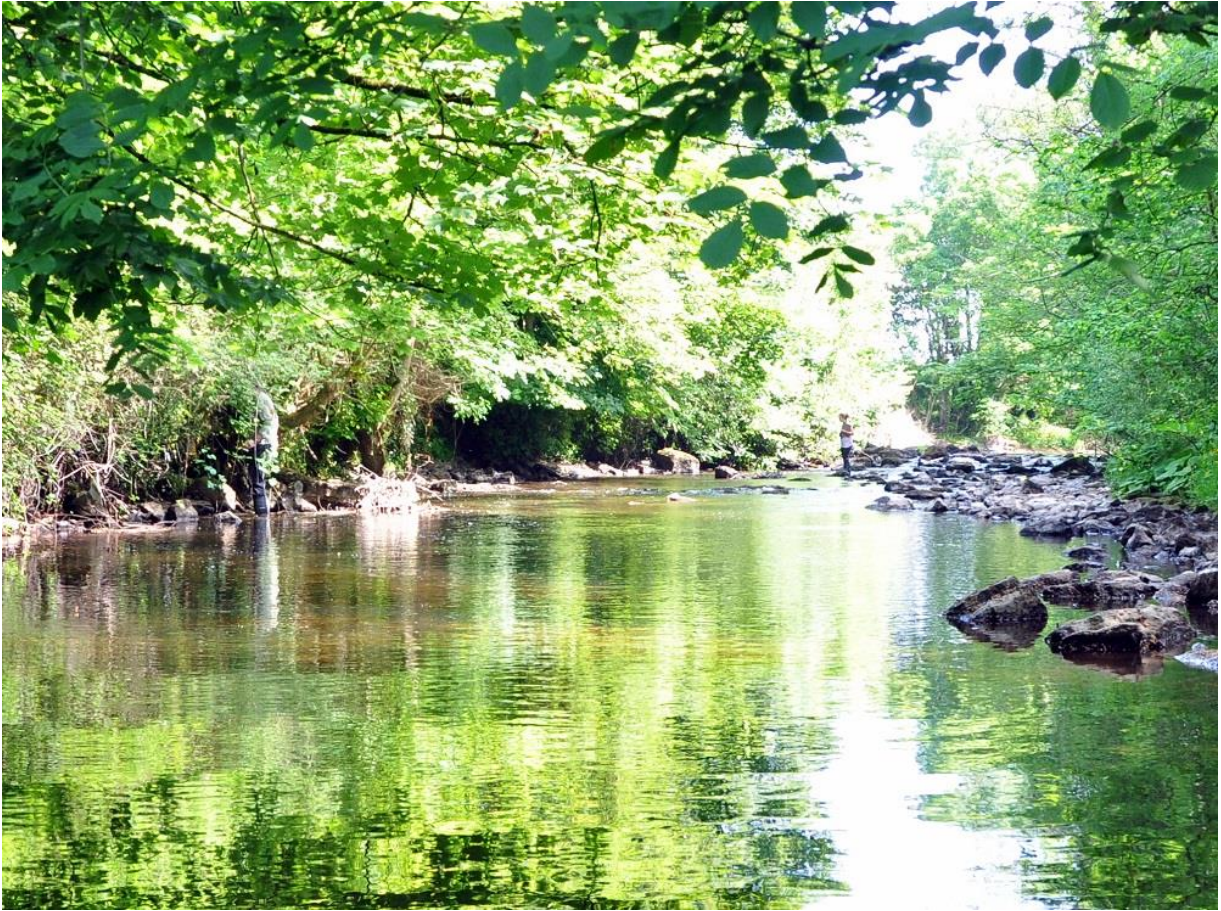


Plate 21 Otter survey 2013.

Name of project

Atlantic Aquatic Resource Conservation (AARC) Project

Remit of the project

The Atlantic Aquatic Resource Conservation (AARC) Project was funded through the 2007-2013 Atlantic Area Programme. It was an association between 13 international partners in a three-year project (2010-2012). The broad aim of AARC was to 'cooperate intensively to deliver a strategy for Integrated Water Resource Management (IWRM)'. A central focus was 'culturally and economically important migratory fish species which link marine, coastal and freshwater resources'. From the Irish perspective, we dealt with restoration initiatives for Atlantic Salmon in the Shannon System. This work included (1) determining the genetic composition of contemporary and historical populations of salmon in the Shannon, and (2) comparing the relative wild performance of the progeny of Feale, Mulkear and Shannon wild and hatchery salmon populations.

Progress to-date

The objectives set out in the project application in 2010 were completed by the end of 2012. There were a number of significant achievements in the project including the sourcing of broodstock salmon and the hatchery rearing of experimental eggs for the relative survival studies for a number of Shannon salmon populations. Experimental eggs were transferred from ESB's Parteen Hatchery to experimental sites on the River Suck. Quantitative electrofishing was carried out to establish densities of salmon fry at the respective sites. The genetic origins of all sampled fish were recorded through fin clips. Important morphometric information from broodstock fish was recorded throughout the project, through electrofishing surveys, right through to smolt capture. These results showed significant growth rates and the migration of a number of smolts as one-year old (S1).

Migrating fish were initially trapped using rotary screw traps. By early 2012 another significant milestone in the project was the installation of a Passive Integrated Transponder (PIT) tag array in the River Bunowen at Clonbrock Demesne, County Galway. This provides an additional tool to analyze the relative proportions of smolts migrating from the River Bunowen.

The compilation of a specific Shannon AARC GIS was completed in 2012. This database will include all AARC survey data including: potential spawning habitats, electrofishing survey results (ESB, IFI and UCC surveys), water quality layers, preliminary barriers data, and restocking sites. This mapping tool will help optimize the presentation of relevant survey data and will help inform management decisions relating to Shannon salmon conservation. Other project milestones include:

- Consultation and information dissemination to all stakeholders (seminars, newsletters)
- Complete salmonid spawning habitat surveys for the River Suck catchment (kayaks and on foot)
- Morphometric analysis for all salmon sampled during electrofishing and trapping programmes on the Bunowen and Tirur
- Provisional DNA abstraction from historical scale samples from the Shannon (UCC)
- Hosting of the final AARC project conference in Limerick, Ireland in November 2012



Plate 22 Electrofishing surveys on the River Suck as part of the analysis of survival to year two of experimental AARC fish. PIT tags were inserted into experimental fish under anaesthetic with a handheld injector (right photo).



Plate 23 A Passive Integrated Transponder (PIT) tag array was installed in the River Bunowen to monitor PIT tagged pre-smolts and smolts migrating through the River Bunowen. The array was installed by Biomark, an American firm specialising in fish tracking.



Plate 24 Assessments of spawning habitats were carried out on the entire River Suck catchment as part of the AARC project. These surveys covered all areas by foot and by kayak and used geo-location techniques for mapping the potential

spawning areas throughout the catchment. Above, spawning areas on the Springfield River, Williamstown, County Galway.



Plate 25 The final AARC project international conference was held in the Strand Hotel, Limerick in November 2012. Pictured are representatives from the various international partner institutions, keynote speaker and facilitators at the conference.