Developments in Inland Fisheries Ireland Research

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Iascach Intíre Éireann
Inland Fisheries Ireland

Welcome to the Newsletter

During the long spell of hot, dry weather this summer, IFI Research suspended some survey operations in lakes and rivers where high temperatures and low water levels reached a threshold that placed fish at risk of stress.

That does not mean we were not busy in the field. The stories in this issue highlight two important tasks for IFI researchers: testing the potential of new technologies for fisheries research and developing protocols for assessing Ireland's fish stocks and their habitat.

As always, we thank all IFI staff who contribute to our research programmes and to this newsletter.

Slán,

Dr. Cathal Gallagher, Head of Research & Development

In this issue

Another Perspective — Exploring the Application of Drones in Fisheries Research

Brian Coghlan (NBP) takes a drone on a flight

Drone survey of river barriers

Drones, or unmanned aerial vehicles, have become a familiar sight overhead. Scenic video of places of interest is a popular application, and IFI has produced a bird's-eye view of the Erriff fishery (**https://goo.gl/YsFk6Y**). As this technology becomes lighter, cheaper and more advanced, IFI Research is exploring how we can put drones to work for science in our survey programmes.

The National Barriers Programme (NBP) has already started using drones to examine the effect of manmade structures on fish passage in rivers. Drones are being used to map barriers along river channels and to remotely assess large barriers pre– and post- mitigation works. In addition, drone imagery provides supporting documentation for the planning process, can be used to create 3D images of structures and helps to foster stakeholder engagement.

Drones are useful for rapid assessment of river habitat. In July, an IFI Research team used a drone to assess physical habitat along the River Crana, a salmon river in County Donegal affected by the extreme flash-flooding event in August 2017. Similarly, the Environmental River Enhancement Programme will use drones to collect hydromorphology data across river channels, riparian corridors and floodplains to monitor OPW enhancement works in drained rivers.

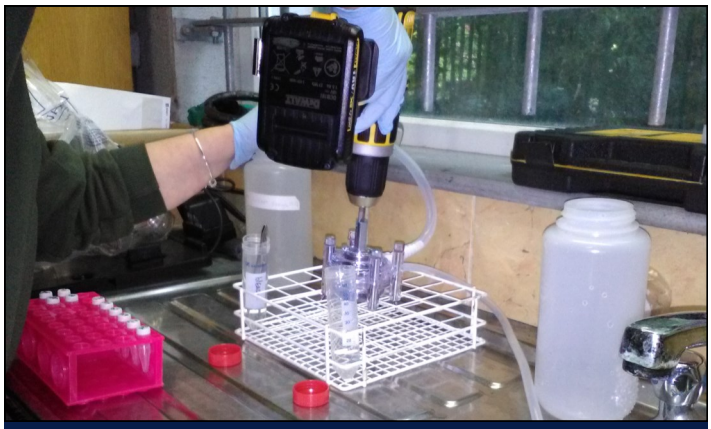
The National Research Survey Programme plans to use this technology to give us the fish-eye view as well as the bird's-eye view. The team has developed a project to use aerial drone imagery to map the invasive waterweed *Lagarosiphon* on Lough Corrib. Furthermore, the project will test a remotely operated submersible for underwater survey work as an alternative to scuba diving or snorkelling.

Key reasons that make drones so useful for research are integration of GPS navigation for mapping, improvements in camera stabilisation and image quality and the opportunity for easier access to difficult-to-reach locations. With underwater as well as aerial drones and manufacturers continually developing new sensor technologies, the sky is not the limit for drones in fisheries research.

A lamprey redd (light stony area) from the air

eDNA — A Genetics Approach to Fish Stock Assessment

Throughout their lives, animals shed DNA, contained in skin cells, mucus, etc., into their environment, where it slowly accumulates and decays over time. Over the last decade or so, conservation biologists have developed techniques to extract this environmental DNA (eDNA) from water, sediment, and even air for genetic analysis. This summer, IFI Research teams are investigating whether eDNA can be used to monitor Ireland's threatened fish populations.



Extracting eDNA with a water pump and filter

To extract eDNA, water samples can be filtered using a pump powered by a cordless drill—a portable set-up that allows samples to be processed at suitable locations in the field. The filter captures biological matter present in the water and is then bottled in a preservative solution for storage and transport to a genetics laboratory, where the eDNA can be extracted, identified and quantified.

In a feasibility study with Laura Weldon of the University of West England, IFI's Eels team successfully extracted eel eDNA from water samples filtered from Lough Corrib in June. The Eels team is now filtering eDNA samples during fyke-net surveys at more lakes, and they hope that by the end of the summer, the data will establish the relationship between eel eDNA in lakewater and eel biomass in lakes.

Eel slime in lakewater: a source of eDNA for population genetics?

IFI Research's Habitats team is working with researchers at University College Dublin to trial eDNA surveys of shad and sea lamprey distribution. In summer, these migratory species travel through estuaries to reach their spawning grounds. The Habitats team have collected water samples from the Rivers Lee, Ilen, Boyne and Liffey to test whether runs of shad and lamprey can be detected using eDNA.

Extracting eDNA from aquatic habitats can quantify relatively rare species in waterbodies, and this technique is non-invasive, without any need to capture fish or to remove scales or biopsies for analysis. These advantages make eDNA a useful tool for IFI Research to apply in fisheries conservation research.

Nicola O'Gorman (Habitats) sampling water from the Liffey

What's Kicking? Testing an Alternative Way to Monitor Shad Spawning

Twaite shad are challenging to monitor because the adults only enter estuaries briefly each year to spawn. After spawning, their tiny, transparent eggs settle on the riverbed for four to eight days before hatching. This summer, IFI Research's Habitats team is trying out kick-net sampling at spawning sites as an alternative survey method for shad.

Eggs are sifted from the riverbed samples for counting, and some are kept for genetic analysis to confirm that they are shad. Early results indicate that shad spawning habitat may be more variable than previously known. The results will help conservation management of spawning areas in the Slaney, Munster Blackwater and Barrow–Nore–Suir Special Areas of Conservation under the Habitats Directive.

Top: Tara Gallagher (Habitats) kick sampling a river. Bottom: a shad

COMPASS — Investigating Marine Survival of Smolts with Acoustic Telemetry

A rotary screw trap in the Castletown River

Smolts on their way to sea: salmon (top) and sea trout (bottom)

COMPASS is a transnational project focusing on the coastal seas between Ireland and western Scotland. Partly funded by the European Regional Development Fund, the project aims to build cross-border capacity for monitoring and managing marine protected areas. To accomplish this, COMPASS project partners are establishing data management infrastructures and a state-of-the-art network for oceanographic sampling and for tracking marine life.

As part of COMPASS, IFI Research is collaborating with Northern Ireland's Agri-Food and Biosciences Institute (AFBI) to track the movements of salmon and sea-trout smolts as they migrate from rivers out to sea. Survival of smolts as they enter the marine environment to grow to adulthood is vital for maintaining healthy population levels in both species.

Since May, over 700 salmon and sea-trout smolts have been captured by a rotary screw trap on the Castletown River, which rises in County Armagh and flows into Dundalk Bay. Forty sea-trout smolts were tagged with tiny transmitters surgically implanted into their body. These transmitters emit a signal that can be detected by an array of 20 acoustic receivers moored to the seabed around Dundalk Bay.

North of Dundalk, more receiver arrays between Larne and Carlingford are operated by AFBI, who are also tagging migrating smolts. This joint effort provides telemetry coverage in key areas along the northeast coast that will allow COMPASS researchers to determine the marine habitat used by smolts and their survival rate in inshore waters.

COMPASS is the latest project to rely on IFI Research's expertise in tracking fish using acoustic telemetry. This research will deliver baseline data that will help the development of appropriate conservation strategies for salmon and sea trout in the marine phase of their life cycle.

An acoustic receiver and diagram of one in situ on the seabed

Tagging Programme Confirms Transatlantic Movement of Porbeagle Sharks

Since the 1970s, Irish charter boat skippers have attached plastic tags to the fins of sharks for mark–recapture analysis as part of the Marine Sport Fish Tagging Programme. In May in *Fisheries Research*, Willie Roche of IFI Research and colleagues reported how this tagging has confirmed that porbeagle sharks are true oceanic wanderers.

One of the biggest species captured by anglers off Ireland, porbeagles are related to great white and mako sharks, which are known for their long-distance movements. The tagging programme recorded one porbeagle tagged off County Cork that was recaptured 10 years later about 3,300km away off the coast of Newfoundland. This unprecedented finding confirms genetic evidence of mixing of porbeagle populations across the Atlantic Ocean.

The paper concludes that porbeagles need international conservation strategies and shows how tagging complements genetics and telemetry studies of wide-ranging oceanic fish.

Tagged porbeagle shark: when and where will we see her again?

New Thesis on Hydroacoustic Sampling Protocols for Ireland's Fish Biodiversity

In fisheries science, hydroacoustics is the use of sound waves to study the biomass and distribution of fish in a waterbody. This summer, Emma Morrissey of the National Research Survey Programme (NRSP) completed a PhD thesis in which she developed protocols to apply this technology to the conservation of three of Ireland's rarest and most threatened fish species.

Preparing *An tSionainn* for a hydroacoustic survey

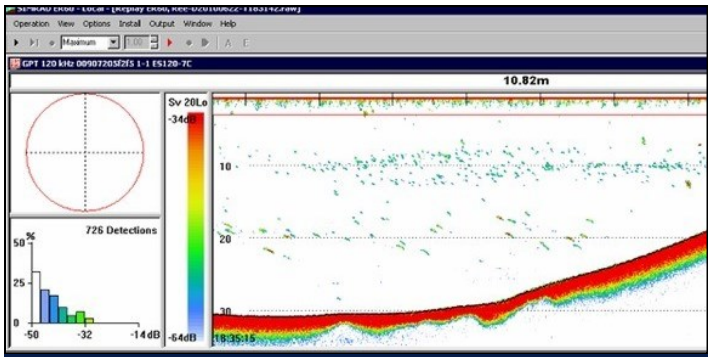
Emma's mission was to develop sampling protocols for Arctic char, Killarney shad and pollan to assess their conservation status for the Water Framework Directive and the Habitats Directive. All three species are pelagic, preferring open-water lake habitat. Furthermore, Killarney shad and pollan are a very special feature of Ireland's biodiversity because they are endemic—these species are found nowhere else in the world.

Hydroacoustic echosounders are similar to the fish-finders used by anglers: high frequency sonar beams are transmitted into the water by transducers, and returning echoes are digitally recorded. For hydroacoustic work, IFI Research is equipped with *An tSionainn*, a 7.2m catamaran fitted out by boat-builders Cheetah Marine for fisheries research. The hydroacoustic results were gathered with simultaneous pelagic netting to ground-truth the data.

Emma Morrissey (NRSP) with a pollan from Lough Derg

In June in *Fisheries Management & Ecology*, Emma and colleagues published a paper on designing hydroacoustic surveys. Forthcoming publications on the biology and ecology of Arctic char, Killarney shad and pollan based on Emma's thesis findings will provide a valuable contribution to scientific knowledge of these rarest of Irish fish. This up-to-date information will be vital to the conservation management of these species, which are potentially vulnerable to the impacts of changes in water quality, climate and fish community dynamics.

Over the last few years, many members of IFI Research and RBD staff around the country have contributed to Emma's hydroacoustic work. As part of the NRSP's survey methodology, hydroacoustics now provides population assessments based on real-time data without the need to capture these rare and elusive fish. Overall, the fruit of Emma's hard work will be to have made IFI a leader in the field of applying hydroacoustic surveys to conservation research for vulnerable freshwater fishes.



Screenshot of hydroacoustic results

Onboard *An tSionainn* for a hydroacoustic survey

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We Hope You Enjoyed the Newsletter

Feedback is always welcome, so please get in touch if you have any comments.

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