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lascach Intíre Éireann Inland Fisheries Ireland

Welcome to the Newsletter

During these crisp, cold autumn days, the heatwaves of summer 2021 can begin to feel distant. At IFI Research, projects on climatic change continue their monitoring programmes and their analysis of data on extreme weather events and their impact on Ireland's fish communities.

This issue also features updates on fieldwork carried out this summer by our research programmes. Follow the bold, blue links to check out the revamped IFI website for pages on these programmes and on fish species found in Ireland. 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

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Feeling Hot, Hot, Hot — Fish and Heatwaves in 2021



The stereotypical Irish summer took a holiday this year. A heatwave in July was followed by one of the warmest Septembers ever recorded in Ireland, with temperature records broken at several weather stations. While people flocked to the water to cool down and enjoy the sunshine this summer, IFI Research investigated a very different story for fish beneath the surface of Ireland's rivers and lakes.

Droughts and heatwaves are both very bad news for fish. Droughts shrink their habitat as rivers and lakes become shallower due to lack of rainfall. Heatwaves increase water temperatures and decrease dissolved oxygen in water. These suffocating conditions can lead to fish kills. During the summer, IFI staff monitor for signs of fish in distress and ask to anglers to practice catch-and-release or even take a break from fishing if conditions get too stressful for fish to survive.



Lough Sheelin: temperature peaking at lake surface in July 2021

This summer, the Climate Change Mitigation Research Programme (CCMRP) and the OPW Climate Project busily gathered data from field surveys, weather stations and a network of data loggers in rivers and lakes around the country. On multiple occasions in July, the team's sensor network recorded peaks of extremely high water temperatures in excess of 26 °C in the Erriff, Owenriff and Gweebarra catchments.

In Lough Sheelin, where the team operates a data buoy that monitors temperature throughout the water column, warming of the lake's surface during July quickly approached temperatures lethal for some fish; however, deeper waters responded more slowly to the heatwave. In the upper Gweebarra catchment, the team found that streams close to pristine conditions had the capacity to resist significant falls in dissolved oxygen across riffle and pool habitats, despite water temperatures up to highs of 24.7 °C.

The team's findings confirm that lakes can provide a thermal refuge for fish during heatwaves. Similarly, although upland spate rivers are vulnerable to heatwaves due to rocky habitat that soaks up solar radiation and a lack of shady tree cover, the effects of heatwaves may be buffered by high water quality. By studying extreme weather events, IFI Research hope to identify the most resilient fish habitat and to recommend strategies that will help protect Ireland's native cold-water species from climatic change.



The CCMRP team in action: river survey during low water conditions

Developments in Inland Fisheries Ireland Research

The National Brown Trout Programme — Assessing Ireland's Wild Brown Trout Fisheries

The brown trout is one of our most widespread native fish, and some of the best wild brown trout fisheries in Europe are found in Ireland's large lowland lakes. The National Brown Trout Programme (NBTP) in IFI Research will target significant issues in Irish brown trout ecology through work on stock assessment, population dynamics, genetic structure and environmental pressures. The programme will provide evidence-based recommendations for the management of this key species in Ireland's national angling resource.

One goal of the NBTP is to model the survival of juvenile trout to adulthood. Fieldwork commenced this summer with electrofishing of habitat suitable for juvenile trout in streams flowing into two important wild brown trout fisheries, Lough Ennell and Lough Carra. The NBTP will monitor population trends in these index catchments over time to gather data for life-history modelling. This work will help inform strategies to restore the carrying capacity of trout streams and to safeguard their contribution to adult stocks in the lakes.



Tuna CHART Update 2021

Atlantic bluefin tuna are big, powerful fish, measuring up to 4 metres in length and weighing up to 900 kg. Although commercial and recreational fisheries are strictly regulated to help protect this vulnerable species from overfishing, the Tuna CHART project provides marine recreational anglers a unique opportunity to catch one of these giants while contributing data to support their conservation.

Since 2019, authorised charter skippers acting as citizen scientists have tagged and released bluefin caught by anglers on board for a scientific fishery to collect data. The skippers use GPS-enabled tablets to collect and upload measurements on each bluefin captured and tagged to an online geodatabase. GIS dashboards allow IFI Research to monitor the fishery remotely and provide each skipper with secure access to maps of their own submitted data. In 2021, 22 authorised skippers operated out of Donegal, Sligo, Galway, Clare, Cork and, for the first time, Waterford. Tuna fishing activity is also monitored by IFI protection patrols. Another goal of the NBTP is to proactively investigate wild trout fisheries to address the interests of angling stakeholders. This year, electrofishing and trout habitat surveys were conducted in tributaries and along the main channel of the River Liffey to investigate the health of its trout stocks. This work received invaluable support from IFI Dublin regional staff, who liaised with local trout angling clubs to identify hotspots for study and who carried out electrofishing surveys with research staff.

The NBTP also forms strategic partnerships with experts in other research institutions, and this year, the programme facilitated sampling for stomach contents and genetic analysis for further studies. These strands of information update the wealth of data on brown trout ecology built up by IFI and its predecessors. Ultimately, the NBTP aims to develop and support fisheries policy and management strategies that are founded in robust, world-class scientific evidence and an up-to-date understanding of a changing landscape.



Electrofishing on the Liffey by IFI Research and IFI Dublin region staff

As the 2021 season draws to a close, over 240 bluefin have been tagged. In comparison with a bumper year of 685 bluefin tagged in 2020, sightings and taggings were lower this year and more similar to 2019, with only Donegal Bay producing bluefin in good numbers. Data collected by Tuna CHART will contribute to monitoring of bluefin migration by the international fisheries commission ICAAT.



Bluefin tagged in Donegal Bay, August 2021 (estimated wt. 184kg)

Developments in Inland Fisheries Ireland Research

Where Do They Get To? — New Study Provides Insights into Salmon Distribution at Sea

The life of wild Atlantic salmon at sea has proved difficult to study as they range over a vast area of the North Atlantic Ocean in search of prey. In September in *Nature*, a study led by Audun Rikardsen of NINA and including Paddy Gargan of IFI Research as a co-author reported a tracking study of 148 adult salmon tagged as they returned to sea after spawning from rivers across Europe.

The study, which included 27 fish from rivers in the southeast of Ireland, used pop-up satellite archival tags (PSATs), which detach from the fish after a set time and float to the surface to transmit their data via satellite. The PSATs showed that adult salmon ranged over a wider area of the North Atlantic and further northwards towards the Arctic Ocean than previously thought. The tagged fish showed increased diving activity around highly productive ocean frontal areas, where warmer Atlantic waters meet colder Arctic waters, which indicates that these areas may be important feeding grounds for salmon.



Probable distribution areas of migrating salmon in the North Atlantic

The study suggests that global warming is likely to shift these ocean fronts northwards, forcing salmon to burn up more energy during migration to their marine feeding grounds. This means that salmon populations in the future face a fight against the likely impacts of climatic change both on the marine food webs they feed on as adults and on the river systems they rely on for habitat as juveniles.

New Study on How Sea Lice from Salmon Farms Affect Sea Trout Runs

Sea lice are small crustaceans that attach to fish to feed on their mucus and blood, thereby injuring their skin and exposing the fish to further infections. These parasites reach high levels at sites of marine finfish aquaculture and can infest wild salmonids as they migrate past fish farms, which has become a major concern for the angling community.

In September in *Aquaculture Environment Interactions*, Sam Shephard and Paddy Gargan of IFI Research reported long-term records from five Irish rivers to explore relationships between annual **sea trout** runs and estimated number of lice at nearby salmon farms. The study indicates that sea lice from salmon farms can have a strong impact on wild sea trout when they are migrating in spring. This study contributes further evidence that local conditions are important in how sea trout populations are negatively

Upcoming Event — EIFAAC Symposium 2022

The European Inland Fisheries and Aquaculture Advisory Commission (EIFAAC) promotes research on the sustainable development, conservation and management of Europe's inland fisheries and aquaculture resources. Next year on June 20th-21st, Inland Fisheries Ireland and the Department of the Environment, Climate and Communications (DECC) are scheduled to host the EIFAAC Symposium 2022 in Killarney, Co. Kerry. The symposium will feature five themes:

- Inland fish stock assessment
- Developments in freshwater fish monitoring technologies
- Assessing climate change impacts on inland fisheries
- Citizen science
- Traditional freshwater vs recirculation aquaculture systems

affected by lice infestations from nearby salmon farms. This suggests that aquaculture regulations on treating lice infestations may need to consider what is the best approach for each bay containing salmon farms, rather than apply the same recommendations at all sites.



Sea trout post-smolt with sea lice (orange-brown spots on its head)

More information on the symposium is available at https://tinyurl.com/eifaac-symposium-2022.







EUROPEAN INLAND FISHERIES AND AQUACULTURE ADVISOR COMMISSION

Developments in Inland Fisheries Ireland Research

Studying a Spawning Hotspot — St. Mullins on the River Barrow



The River Barrow finishes its winding journey to the sea near St. Mullins, a village in County Carlow which is notable for its scenic setting and wealth of historical monuments. Although St. Mullins is a pleasant place for human visitors, some of the fishy visitors to the Barrow stop there less willingly. A weir at St. Mullins acts as a barrier to fish movements, thereby limiting habitat and changing the spawning behaviour of protected migratory fish in Ireland's second largest river.

St. Mullins is an important spawning site for twaite shad, which migrates from coastal waters into estuaries in the southeast to spawn in the late spring/early summer. Adult sea lamprey also migrate in from the sea at this time of year. Although lamprey usually swim upstream to dig spawning redds in stony riverbeds, the weir at St. Mullins blocks their migration, drastically limiting their spawning habitat in the Barrow. Neither shad nor lamprey are as capable of the spectacular feats of leaping over or climbing obstacles for which other migratory fish, such as salmon or eels, are so famed.

IFI Research teams studied this spawning hotspot for migratory fish intensively in 2021. Redd counts recorded a large number of spawning adult lamprey in their redds during this period. Kick-net sampling of the riverbed for shad



Twaite shad

eggs on a weekly basis over the spawning period showed that shad spawning peaked in mid-May. An exciting development in conservation science is environmental DNA (eDNA) analysis, which is a non-invasive way to monitor sensitive locations. Water samples were collected along the river and filtered by IFI Research teams, and DNA amplification of the samples will allow the detection of shad around spawning sites without the need to capture them.



As well as ecological data to support fish conservation, IFI also researches socioeconomic aspects of angling. Interviews with approximately 100 anglers at St. Mullins, including specimen hunters trying for big shad over 48 cm that qualify for **specimenfish.ie**, provided valuable data on angling effort and numbers of fish caught. As part of this outreach activity, all anglers were encouraged to practice catch-and-release and use best practice for fish handling to help shad recover and continue on their way to spawn.

To complete the picture at St. Mullins, drone footage was shot there over the summer, which IFI Research will use for barrier and habitat assessment. Both **DiadES** and the **Habitats Directive Project** will use these surveys to explore how river barriers impact the migratory and spawning behaviour of protected fish and their population dynamics.







Feedback is always welcome, so please get in touch if you have any comments. Contact Rory Feeney at 01 8842636 or <Rory.Feeney@fisheriesireland.ie> Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin D24 Y265 https://www.fisheriesireland.ie/what-we-do/research

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