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lascach Intíre Éireann Inland Fisheries Ireland

Welcome to the Newsletter

Citizen science, in which people with special interest, knowledge and skills participate in research projects, is now an important partnership in science to further our understanding the natural world. This issue highlights two IFI Research programmes in which anglers are volunteering their expertise to investigate fish in Ireland.

This issue also highlights papers published in the scientific literature in 2019 to which IFI Research has contributed to communicate results from our research programmes.

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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Tuna CHART — Citizen Science Collects New Data on Bluefin Tuna Migration



Renowned amongst anglers as a hard-fighting giant, the Atlantic bluefin tuna is also famed as a premium quality fish in Japanese cuisine. Although this high value species has suffered from overfishing, recent stock assessments have been more positive about bluefin abundance. ICCAT, the international conservation commission which regulates tuna fisheries, ruled in February 2019 that Ireland may allow targeting of bluefin by recreational anglers to collect scientific data. IFI Research is now running a new citizen science data collection project involving charter angling skippers to investigate bluefin migration.

The bluefin tuna is a warm-blooded fish, maintaining a body temperature higher than that of ambient water. This means that bluefin are fast, capable of bursts of 60 km/hr. Bluefin tuna is an apex predator, ranging over thousands of kilometres from feeding areas across the North Atlantic to spawning grounds. Bluefin usually appear around Ireland in autumn, occurring most often off the northwest coast to date.

To collect data on bluefin migration, IFI Research has initiated **Tuna CHART** (CatcH And Release Tagging) in partnership with the Marine Institute, the Sea Fisheries Protection Authority, DAFM and DCCAE. Fifteen charter skippers are now authorised, under strict conditions and monitoring, to catch, tag and release bluefin tuna in August-November 2019.



Bluefin with yellow ICCAT tag, Donegal Bay (Photo: Adrian Molloy)

The vessels' crews have received training in fish welfare, tagging and data collection. As well as heavy duty tackle to target this powerful species, authorised skippers are equipped with tagging gear and GPS-enabled tablets to track vessel location and record biological data. To ensure its survival, each fish is measured, tagged and released without being taken from the water. Socioeconomic information about each fishing trip is also recorded, and the data are automatically uploaded to IFI's online database, allowing real-time monitoring of the fishery.

To learn more about bluefin tuna and the Tuna CHART project, please visit https://tinyurl.com/tuna-chart.



North Atlantic bluefin range and authorised vessel ports (inset)

COMPASS Update — Partnership with Anglers to Track Sea Trout

Last August, volunteers from the Dundalk & District Brown Trout and Salmon Anglers helped IFI Research to catch sea trout in the Castletown River as part of the **COMPASS** project, which is supported by INTERREG VA European regional funding. This work by citizen scientists will help IFI Research to learn more about the movements of sea trout.

Finnock are small-sized sea trout that return to their natal river to spawn after only a few months at sea. Common in many Irish rivers, finnock can range up and down the coast, moving into and out of different rivers with the tides. With the help of the Dundalk anglers, IFI Research fitted 50 finnock with tiny acoustic transmitters that will allow the fish to be tracked for a year in both freshwater and at sea by an acoustic receiver array along the northeast coast.

Overall, the tracking will investigate whether sea-trout stocks from different rivers mix during the marine phase of their life and will potentially identify sea-trout hotspots along the northeast coast. To watch videos on acoustic tracking of salmon & sea trout for the COMPASS project, please visit the IFI Research YouTube channel.

New Insights on Predation of Salmon at Sea

Pop-up satellite archival tags can record data, then transmit it via satellite after a pre-programmed interval. On May 27th, Nature published a study co-authoured by Paddy Gargan of IFI Research and colleagues that used this technology to investigate the fate of 156 adult salmon, including 27 from Ireland, that were tagged as they returned to sea from 12 rivers around Europe and Canada.

By matching patterns of depth and temperature recorded by the tags to the behaviour of marine predators, Paddy and colleagues concluded that 14% were eaten by large fish or marine mammals. The most important predators appeared to be warm-blooded—or endothermic—fish, possibly bluefin tuna or porbeagle sharks. The study suggests that predation risk is higher for salmon from the southern part of their range, including Ireland, and is an extra stressor for populations that are already vulnerable.



Predation of salmon at sea (Irish fish in grey markers)



James Barry of COMPASS releases a tagged finnock, Castletown River



Invasion Report: Pink Salmon in Ireland, 2017

Native to the river systems flowing into the North Pacific and Arctic Oceans, pink salmon have only very rarely appeared in Ireland. In 2017, however, an unprecedented 36 pink salmon were found in 11 river systems around the country. This invasion, which was recently described in the *Journal of Fish Biology* by Mick Millane and colleagues of IFI Research, occurred with widespread reports of pink salmon appearing in the North Atlantic region, possibly representing westward straying of this species from populations established in Russia.

Pink salmon have a life cycle that features a gap of two years between spawning migrations. So far in 2019, 11 pink salmon have been recorded in 4 Irish rivers: the Moy, Laune, Erriff and Drowse. A guide detailing how to identify pink salmon and report any sightings to IFI can be found at https://tinyurl.com/ifi-pink-salmon.



Pink salmon (bottom) compared with native Atlantic salmon (top)

The Pike & Trout Relationship — Ecological Contexts & Management Scenarios

The management of pike as a predator of brown trout in lakes where they coexist raises a perceived conflict between angling stakeholders. Ecological interactions between these two species happen in a broader context of fish community dynamics, environmental change and angling pressure. New papers from IFI Research update our understanding of the impact of pike on trout stocks.



Since the 1970s, roach have invaded many Irish lakes, dramatically altering their food webs. In July in Hydrobiologia, Paul McLoone and colleagues of IFI Research compared the diet of pike in three Irish lakes in the 1960s and 1970s with data from 2016-2017. The results indicate that a marked shift in the diet of pike towards roach over this period may have reduced pike predation of perch and trout.

In October in Ecological Modelling, Colm Fitzgerald of IFI Research and colleagues evaluated the effect of pike removal and trout angling regulation on trout biomass in prey availability scenarios. Size-based alternative population modelling, which accounted for fish growth, pike cannibalism and model uncertainty, showed that the effectiveness of predator removal decreases in lake ecosystems with abundant alternative prey.

Taken together, these papers from the Pike Research Programme highlight the complexity of multi-species interactions and their impact on stock recruitment in mixed lake fisheries.

Assessing Conservation Status of Larval Lamprey Populations

Every six years, European Union member states issue Article 17 reports on the conservation status of designated species and habitats as part of the Habitats Directive. As well as providing information on protected fish species in the latest Article 17 reports, IFI Research have developed a new method for assessing the status of lamprey populations.

Three species of lamprey protected by the Habitats Directive occur in Ireland: brook, river and sea lamprey. To monitor lamprey populations, the Habitats Directive team at IFI Research conduct catchment-wide electrofishing surveys for larval lamprey, known as ammocoetes, and measure their lengths to determine whether the fish caught are smaller, younger recruits or larger, older fish.

In January in Aquatic Conservation: Marine & Freshwater *Ecosystems*, Sam Shephard and colleagues of IFI Research reported a new model based on the idea that populations impacted by threats have a more limited number of lengths and ages present. Plotting length-based indicators (LBIs) against a reference gradient gives an indication of the status of the population. LBIs are simple to calculate and allow rapid comparison of lamprey populations.

Information about lamprey is always welcome and can be Tara.Gallagher@fisheriesireland.ie. reported to More information about spotting lamprey in rivers is available in Issue 3 and at https://tinyurl.com/ifi-habitats-team.





Lamprey population scenarios on conservation reference gradient

Diversity & Ecology of Fish Communities in Ireland's Estuaries

Estuaries are transitional waters, where freshwater rivers meet and mix with the ocean, and where tides ebb and flow, creating dynamic, highly productive ecosystems. Every autumn, IFI research and regional staff survey estuaries to assess the ecological status of their fish communities for the Water Framework Directive (WFD) and to monitor species of interest to sea anglers. In September in *Regional Studies in Marine Science*, Lynda Connor and colleagues of IFI Research report an analysis of these surveys that provides baseline data on the diversity of fish communities of Ireland's estuaries.



Pulling a seine net ashore, Gweebara Estuary

In estuary surveys, beach seines are used close to the shore, covering the littoral zone, which is shallow and usually intertidal, whereas fyke nets are used in deeper water that is subtidal. Using data on 202,917 fish from 80 species caught between 2008 and 2017 in 37 estuaries, Lynda and colleagues analysed the distribution of species between these two zones and how it related to the environmental characteristics of each estuary. Parameters describing the amount of subtidal area and connectivity of the estuary to the sea showed significant relationships to fish communities in the estuaries studied.



Recording survey data from a beach seine, Shannon Estuary



Deep-snouted pipefish (estuarine) & juvenile thornback (marine migrant)

In ecology, a guild is a group of species that exploit their habitat in a similar way. Lynda and colleagues found that most fish in estuaries were from one of two guilds: estuarine species, which prefer to live in estuaries throughout their life cycle, or marine migrants, which normally live in marine conditions but which visit estuaries for part of their life. The changing proportion of estuarine species in the littoral zone versus marine migrants in the deeper subtidal zone was the key driver of similarity between estuary fish communities.

An interesting finding from the analysis was the proportion of juveniles present in fish communities in estuaries. Calculations using lengths of fish recorded in the field surveys showed that 73% of all fish caught were juveniles, with 57 out of 77 species consisting of more than 50% juveniles. This highlights the importance of estuaries as nursery habitat that shelters juvenile fish.

Overall, this scientific paper provides a reference list of fish species in Ireland's estuaries and their relationship to their environment, which establishes a baseline for monitoring potential impacts of climatic change. Reports from WFD estuary surveys may be explored at http://wfdfish.ie/.



Species richness & guild composition of estuaries around Ireland



We Hope You Enjoyed the Newsletter

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 http://www.fisheriesireland.ie/Research-and-Development/fisheries-research.html

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