



Iascach Intíre Éireann
Inland Fisheries Ireland

SPOTLIGHT
series
Researching Climate Change

Did you know? 2022 was the warmest year on record and Ireland's mean temperatures could rise between 1°C and 1.6°C by 2050.



Data buoy on Lough Sheelin records water temperature at different depths throughout the water column as well as surface water quality data (dissolved oxygen, conductivity and chlorophyll a, which is indicative of the amount of algae at the lake surface). Data is transmitted from the data buoy to Inland Fisheries Ireland researchers in real-time, allowing quick assessments of the current lake status.



Playing our part in mitigating climate change

"Many Irish fish are very vulnerable to even small changes in their habitat and the water they live in. They need our help to slow the decline in their numbers," says Fiona Kelly, Senior Research Officer at Inland Fisheries Ireland, (pictured above).

"Everyone can play their part in mitigating climate change. However, at Inland Fisheries Ireland, we have the added privilege of being able to carry out scientific research that can ultimately help set out pragmatic action plans to protect them."

Ireland's mean annual temperatures could rise by between 1°C and 1.6°C by 2050, with summers becoming hotter and drier, and winters becoming wetter and warmer. This will significantly alter the natural water cycle of our rivers, which will experience flooding at one extreme, and drought at the other, with consequent habitat loss. Our wildlife could be significantly affected: its behaviour and geographical spread is likely to change. Conditions may also become more favourable for non-native or invasive species, which could lead to native fish being out-competed.



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The Climate Change Mitigation Programme was set up to assess the impact of climate change on Ireland's fish and habitats



Ciarán Twomey of the Inland Fisheries Ireland research team, measuring river temperatures and dissolved oxygen levels on the River Deel during a heatwave.



Impact on our fish

Seán Kelly, Research Officer at Inland Fisheries Ireland, (pictured above), explains how our important coldwater salmonids – including Atlantic salmon, brown trout and Arctic char – are impacted.

Fish have a variable body temperature that is normally similar to their environment and therefore their biological functions are dependent on the temperature of the water they live in. Fish have different thermal (heat) tolerances and when water temperatures rise, this can affect behaviour, growth, survival and their ability to resist different types of diseases. This can mean fish becoming stressed and even dying.

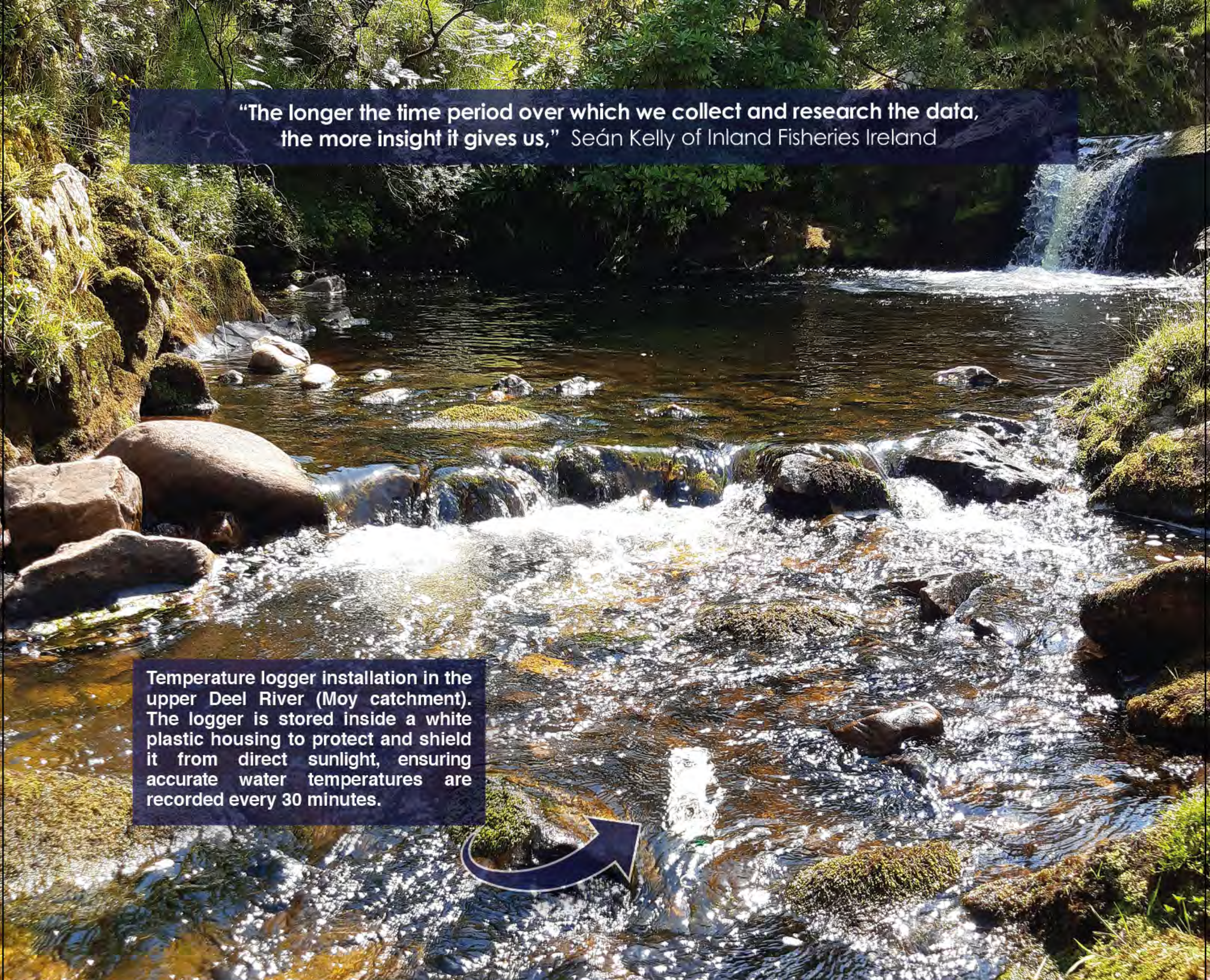
On the other extreme, flooding can wash silt and debris downstream and it can be hard for young fish to tolerate or survive these conditions. Impacts from climate change are likely to be more severe when river or lake habitat or water quality gets worse.

Inland Fisheries Ireland's Climate Change Mitigation Research Programme was set up to assess the impact of climate change on Ireland's fish and habitats. Its aim is to bridge gaps in knowledge and build on these to identify strategies to help mitigate the effects of climate change.



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"The longer the time period over which we collect and research the data, the more insight it gives us," Seán Kelly of Inland Fisheries Ireland

Temperature logger installation in the upper Deel River (Moy catchment). The logger is stored inside a white plastic housing to protect and shield it from direct sunlight, ensuring accurate water temperatures are recorded every 30 minutes.



Enhanced data for detailed analysis

One of Inland Fisheries Ireland's key tools is an array of approximately 400 data loggers positioned in rivers and lakes around Ireland. "This really is a significant monitoring network," explains Fiona, "because as well as giving us data over a large geographical area, we are able to record information on several factors including water temperature, dissolved oxygen, water levels, river flows and fish movement."

Where previously only broad-scale climate change impact assessments were possible, thanks to the scale of the information gathered by the network of data loggers, along with advances in mapping and modelling, more detailed analysis can now be undertaken.

"Many of our data loggers have been in place for several years, including during weather events such as heatwaves, droughts and floods. This provides informative data. And the longer the time period over which we collect and research the data, the more insight it gives us," observes Seán.

Based on the data gathered, Inland Fisheries Ireland researchers can develop risk models, created from the layers of information they have compiled. Using these, they can map out a water system, and identify places of lower and higher risk for fish.



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Heatwave and the River Boyne

The heatwave in July 2021 was the most intense on record on the River Boyne in over half a century. During this event, water temperatures were recorded by 46 sensors throughout the catchment. “These showed a difference of over 10°C between the warmest and coolest stretches,” notes Seán. “We produced statistical models that showed that the highest water temperatures during heatwaves occur in wide river channels with low tree cover – often associated with arterial drainage – and rivers draining from lakes. In contrast, headwater streams with a lot of trees and other vegetation on their banks stayed cooler.”

Taking action

“Our research allows us to pinpoint those bodies of water where fish and habitats are most under threat,” says Fiona. “And on the other hand, it highlights rivers that are showing resilience to climate change. We can examine these further to find out why this is the case and they can be noted as waters to protect.”

The information helps the organisation decide how best to use their resources. “For example, colleagues are using our data as part of a scoping project in the Gweebarra catchment in Co. Donegal, to support forthcoming works. Colleagues are also looking to use our data to help scope work in other catchments,” says Fiona.

Inland Fisheries Ireland takes an interdisciplinary approach, drawing from climate science, hydrology, limnology and fish biology. It incorporates data from fish monitoring programmes for example, using data from electrofishing and lake netting surveys carried out by colleagues in other project teams.



Seán Kelly of Inland Fisheries Ireland doing fieldwork.

“Our research allows us to pinpoint those bodies of water where fish and habitats are most under threat,”
Fiona Kelly of Inland Fisheries Ireland



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Meteorological sensor stations, such as the one shown here on Lough Sheelin measuring wind speed and direction and incoming solar radiation, help Inland Fisheries Ireland researchers to directly link changes in climate with the changes observed in river and lake fish habitat.

Advances for the future

Inland Fisheries Ireland is already moving onto the next generation of water monitoring: “We have installed a state-of-the-art databuoy on Lough Sheelin and Lough Currane,” says Fiona. “Among other information, it gathers water temperature information constantly, which gives us access to near real-time data. We can then use this to analyse in detail how the lake responds to events like heatwaves and droughts and we can see when fish are most vulnerable.”

New innovative data loggers will also be installed in river sites in the coming months. They will allow Inland Fisheries Ireland to view the information as it is gathered. This could act as an early warning system during a heatwave, for example, when fish are put under significant thermal stress.

Taking a long and broad view is key. Inland Fisheries Ireland regularly works with other bodies such as the Office of Public Works (OPW). “We want to remain at the forefront of fisheries research,” says Fiona, “because we are seeing how our collective efforts can not only improve and protect our fish and habitats, but also how they can really make an impact on biodiversity in Ireland.”

For more on the work of Inland Fisheries Ireland, please visit **www.FisheriesIreland.ie**



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