



Irish Freshwater Sciences Association

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Book of Abstracts

Hosted by: Dublin City University

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SESSION 1: Full talks (12 min talk + 3 min questions)

S1.01 The conservation status of Ireland's freshwater habitats and species

Richard O'Callaghan, Áine O'Connor

National Parks and Wildlife Service, Department of Housing, Local Government and Heritage

The National Parks and Wildlife Service is responsible for reporting to the EU on the national conservation status of habitats and species protected under the Habitats and Birds Directives. Reports, covering the 2019-2024 cycle, were submitted in 2025. The proportions of freshwater habitats and species failing to achieve Favourable Conservation Status were greater than for all habitats and species combined. All freshwater habitats and 69% of freshwater species reported on under the Habitats Directive were in Unfavourable Status, as opposed to 90% of habitats and 32% of species overall. While 20% of all species assessed were in Unfavourable Bad status, 61.5% of freshwater species were Bad. Two freshwater habitats and three freshwater species have dropped a status class since the 2013-2018 cycle. The freshwater pearl mussel, hard-water lakes and moderate-alkalinity lakes remain amongst Ireland's greatest biodiversity concerns. Water pollution is a pressure impacting 88% of freshwater habitats and 85% of freshwater species, with agriculture the commonest source. Hydro-morphological pressures, including drainage for agriculture, forestry and peat extraction, impact on all freshwater habitats and 77% of freshwater species. Data from the report will inform Ireland's Nature Restoration Plan. For more information see: <https://www.npws.ie/publications/article-17-reports>; <https://www.npws.ie/status-and-trends-ireland%E2%80%99s-bird-species-%E2%80%93-article-12-reporting>

S1.02 “The Right Measure in the Right Place” – utilising scientific data to inform engineering decisions for achieving Water Framework Directive objectives; Case Study: The River Santry

John Stack

Dublin City Council

Directive 2000/60/EC, the Water Framework Directive, incorporated into Irish law by SI 722 of 2003, the European Communities (Water Policy Regulations) 2003 requires Member States to achieve at least ‘good ecological status’ in all surface waters, to maintain existing good status, and to protect high status water bodies by 2027. In the case of heavily modified water bodies or artificial water bodies, the requirement is to achieve ‘good ecological potential’. Achieving good ecological status or potential is to be achieved through River Basin Management Plans (RBMP) and associated Programmes of Measures (POMs), spread over 3 reporting periods, 2010 – 2015, 2015 – 2021, and 2021 – 2027. Ireland is currently in the third cycle of RBMP, due to end on the 31st December 2027. While accurate scientific data has been instrumental in characterising and classifying water bodies, it has also proven useful for identifying pressures impacting watercourses and allowing the prioritisation of measures to address those pressures, for example through the use of Local Catchment Assessments. This presentation will demonstrate how well-designed investigative monitoring programmes and the Local Catchment Assessment method have been used to identify and prioritise pressures on the River Santry and inform measures to mitigate the impact of those pressures.

S1.03 Advancing freshwater science and innovation: Insights from EU-funded projects

Avril Hanbidge, Annette Wilson, Marieke Reuver, Laureen Bascou, Mathilde Vidal

ERINN Innovation

European freshwater ecosystems are increasingly threatened by climate change, pollution, biodiversity loss and invasive alien species (IAS). Addressing these challenges requires coordinated interdisciplinary research and strong pathways to impact. We play a central role in ensuring research delivers meaningful real-world outcomes. Here we highlight three Horizon Europe projects and our role in accelerating their contribution to European freshwater science and management. We lead stakeholder engagement, communication, dissemination and exploitation, all essential for translating scientific outputs into policy and practice. AquaPLAN is investigating the combined impacts of light and noise pollution on aquatic biodiversity and developing evidence based mitigation strategies. GuardIAS is developing a comprehensive invasion management framework spanning prevention, early detection, prioritisation, eradication and public engagement to manage and mitigate IAS in aquatic habitats. MARCO BOLO is building a coherent, interoperable long term aquatic biodiversity observation system, strengthening Europe's capacity to monitor and restore aquatic health. Across these projects, we lead impact acceleration by combining dissemination strategies, impact pathway development and knowledge transfer activities. This ensures complex scientific findings are accessible, usable, aligned with stakeholder needs and ultimately translated into real world action by policymakers, industry and society.

S1.04 Nature-based solutions and catchment management: Bundorragha catchment pilot study and opportunities for catchment scale management in Ireland

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Nature-based Solutions (NbS) are increasingly being put forward as providing measures to address some of the key societal issues facing us at the present day, including climate change, climate resilience, carbon storage, Net Zero, flood management, water quality and availability, and also biodiversity. Understanding the Nature part in NbS is key to understanding solutions and for the implementation of any catchment scale measures. The IUCN definition of nature states that it: "refers to biodiversity at genetic, species and ecosystem level, to all the dynamic processes and features of geodiversity, and to all their interactions". Physical processes in Nature include hydrology, geology, geomorphology and soils, as well as nutrient and carbon cycles; these processes are key elements of functioning habitats, biodiversity and ecosystems. European freshwater pearl mussel (FPM) populations have declined by 90% over the past century. In Ireland, the Bundorragha river catchment is one of the most important catchments for FPM. A pilot study was undertaken between the NPWS, BMT and SLR to examine a novel and innovative approach to integrated catchment management using TUFLOW Catch software, an integrated environmental modelling package. TUFLOW Catch was used to model the Bundorragha catchment including river hydrological dynamics (flow, sediment and water quality), the impact of potential FPM conservation management measures and NbS, at the catchment scale, including land-use change on river water quality and flow behaviour, and also to model potential climate change scenarios. TUFLOW Catch integrated environmental modelling offers a novel approach for the testing and verification of NbS at the catchment scale.

S1.05 Hierarchical Bayesian spatial modelling of Irish river temperature to inform climate change mitigation

Sylvan Benaksas, James Barry, Aoife Walsh, John Coyne, Niamh Treanor, Fiona Kelly

Inland Fisheries Ireland

Climate change is one of the greatest threats facing aquatic habitats in Ireland, especially cold-adapted fish such as arctic char and salmonids. The IFI Climate Change Mitigation Research Project (CCMRP) is a long-term monitoring programme co-funded with the OPW and looks to address a major gap in Irish freshwater monitoring and conservation, a quantified understanding of the thermal regime of our freshwater environments and dynamics of heatwaves under a rapidly changing climate. This monitoring work consists of an array of temperature loggers across 12 index catchments. Hierarchical Bayesian spatial models with R-INLA are being used to quantify the drivers of riverine temperature regimes and model daily reach temperature on a 500m scale across the catchments, with the goal of extrapolating to a national scale model. This extensive monitoring dataset allows us to quantify hotspots and thermal refuges, the influence of groundwater across Irish rivers, a key influence in thermal refuges, as well as the cooling effects of riparian tree cover. With these outputs we can then inform management through riparian tree planting prioritisation maps and identification of important thermal refuges to inform arterial drainage schemes, habitat restoration projects, native fish conservation plans, invasive species monitoring and heatwave angling closures.

S1.06 Freshwater Biological Association - past, present and future (invited talk - 20 min)

Simon Johnson

Freshwater Biological Association, UK

At the Freshwater Biological Association we are approaching our centenary in 2029, celebrating over 100 years of freshwater scientific research, engagement, training, advocacy and species recovery. The FBA was formed to better understand freshwaters, primarily for human use, from studying declines in salmonid fish (for fishing), to studying the effects on freshwaters of sewage and untreated industrial effluents. From its early days based in Wray Castle on the shore of Windermere, the FBA quickly became a centre for freshwater education, engagement and research, amassing one of the largest freshwater libraries in the world and a hub for innovation and invention. Today, the FBA is still based on the shores of Windermere and still focusses on education and engagement through our training courses, publications and citizen science programmes. Our research now has a more applied focus, and we support doctoral training programmes through student placements and experimental support where they align with our research interests and where our facilities at our Species Recovery Centre can support their work. Our freshwater pearl mussel conservation breeding programme is almost 20 years old and we have reared over 60,000 mussels for release with over 5000 released to date. And the future? That's something we'd love to talk with you about during the meeting. We're open to collaborative opportunities in training, research, species recovery and citizen science so please do come and talk to Simon during the breaks!

S1.07 Monitoring urban streams and rivers, in collaboration with the local community – an integrated citizen science approach: Urban Citizen’s 6.3.2

Susan Hegarty^{1,2}, Laura Ribero^{1,2}, Fiona Regan^{1,3}

¹DCU Water Institute; ²DCU School of History and Geography; ³DCU School of Chemical Sciences

One of the challenges to fulfil the requirements of the Water Framework Directive is the need to gather sufficient data on all waterbodies. With limited resources, statutory bodies focus monitoring on larger rivers, with the monitoring of smaller streams and lower order rivers being monitored less frequently. This is where citizen science can play an important role. The engagement of local communities to monitor their freshwater bodies can also lead to a multidirectional knowledge transfer and the development of communities of stewardship. The Research Ireland-funded project Urban Citizen’s 6.3.2 was a citizen science project that aimed to examine water quality and biodiversity of rivers and streams across the terrestrial area of the UNESCO Dublin Bay Biosphere, in collaboration with volunteers from the general public and local community groups. The project fostered collaboration between academia and the local community, and had an impact in the monitoring of streams which were previously unmonitored. It also led to the local community identifying pressures on their local water bodies.

S1.08 Rescue of the remnant White-clawed Crayfish population in the Munster Blackwater catchment from advancing Crayfish Plague

Chris Peppiatt

National Parks and Wildlife Service

White-clawed Crayfish (WCC) were formerly present in about 50km of the main channel of the Munster Blackwater and two tributaries. In October 2022, crayfish plague, *Aphanomyces astaci*, was first detected by eDNA analysis of water samples and in May 2023, numerous dead crayfish with plague were found in the main channel. From then, crayfish plague continued to advance up the Awbeg River. In October 2024 NPWS instigated a rescue effort of WCC towards the upper end of the Awbeg, where crayfish plague had not reach. Those involved in this rescue effort included staff of NPWS, Cork County Council, Marine Institute, Fota Wildlife Park and independent ecologists. Keeping to strict biosecurity measures, three teams of four, consisting of an experienced, licensed freshwater ecologist, an instream assistant with a net and bucket, and two bankside assistants, each took a section of river for hand-searching. WCC caught were checked for any sign of disease and were swabbed to check for crayfish plague before being transferred to tanks in Fota Wildlife Park. Additional WCC were caught in refuge traps in November 2024 and some more were added from a night catch and from the catch in two training courses in May 2025. Any new additions were kept quarantined in Fota until shown to be plague-free. Following a few early mortalities and removal of a couple of individuals with porcelain disease, there are now over 170 healthy WCC held in Fota Wildlife Park, while crayfish plague now spread to all parts of the Blackwater catchment previously occupied by WCC. Captive breeding success in 2025 was very limited, as would be expected so soon after capture, but there are signs that 2026 breeding will be better. The next step is to decide on an ARK site to which the captive WCC can be released.

SESSION 2: Short talks (7 min talk + 2 min questions)

S2.01 Atomic ecology: applied stable isotope ecology in Irish freshwater research

Brian Hayden

Atomic Ecology

Ireland's freshwater systems face increasing pressure from nutrient enrichment, biodiversity loss, invasive species, and climate-driven change. Addressing these challenges requires tools that bring a functional understanding of ecosystem processes. Atomic Ecology is a new, Wexford-based applied research initiative specialising in stable isotope ecology, designed to strengthen the analytical and interpretative capacity of the Irish freshwater research community. Stable isotopes (e.g., $\delta^{13}\text{C}$, $\delta^{15}\text{N}$, $\delta^{34}\text{S}$) provide powerful insights into nutrient sources, trophic structure, energy pathways, and ecosystem resilience. Through applied research, collaboration, and training, Atomic Ecology supports researchers, agencies, and community groups in integrating isotope approaches into water quality assessment, invasive species studies, fisheries management, and catchment-scale nutrient tracing. This presentation will introduce Atomic Ecology and highlight applied case studies relevant to Irish systems, including nutrient source identification, food web characterisation, and community-engaged lake monitoring. It will also outline opportunities for collaboration with universities, agencies, and citizen science initiatives. By expanding isotope applications to Ireland's freshwater monitoring and research landscape, Atomic Ecology aims to enhance evidence-based, ecosystem-scale ecological management.

S2.02 Underwater video as a novel tool to study salmonids in shallow streams

Seán Neville, Simon Harrison, Tom Reed

University College Cork

The primary contemporary method to sample salmonid populations in freshwater streams is electrofishing. Electrofishing however presents logistical challenges. The method is generally unsuitable for use in streams which are very shallow, have low water conductivity or where endangered species are present (e.g. freshwater pearl mussel *Margaritifera margaritifera*). In Ireland, it can only be practised with a license from May to September so as to avoid harming sensitive life stages. Therefore, research on salmonid populations is limited outside this time frame and in areas unsuitable for electrofishing. Underwater cameras have been used extensively in marine fisheries research to monitor population dynamics. In contrast their use in freshwater environments has been comparatively limited, particularly in shallow streams. However, the development of relatively cheap, compact and robust devices known as action cameras (AC) has enabled new strategies for using camera technology in freshwater fish research. AC technology presents advantages compared with electrofishing surveys, foremost of which is that their use does not harm fish and they can be deployed in very shallow streams regardless of time of year or temperature. Using a novel methodology I found a significant relationship between abundance estimates obtained from AC's and electrofishing surveys in wadeable streams. The results of this research demonstrates AC's potential as a non-invasive alternative to electrofishing.

S2.03 Changing phenology and phenotype of Atlantic salmon in Ireland

Elvira de Eyto, the staff of the Marine Institute

Marine Institute, Furnace, Newport, Co. Mayo

Migration is an important ecological trait that allows animals to exploit resources in different habitats, obtaining extra energy for growth and reproduction. The phenology (or timing) of migration is a highly heritable trait but is also controlled by multiple factors. This is particularly true for diadromous fishes which are sentinels of change in both freshwater and marine domains and are subject to considerable stressors including overfishing and habitat degradation. Here, we describe trends in the migration phenology and phenotype of Atlantic salmon. The commencement of the salmon smolt migration has advanced by one week, although the rest of the migration has remained stable. The upstream migration of adult salmon has become significantly earlier and more homogenous, with at least half of migrating fish returning between one and two months earlier from the marine environment compared to the 1970s. The earlier return of these salmon is coincident with decreasing body size and marine survival, indicating considerable oceanic challenges for this species, as well as considerable impacts on freshwater productivity.

S2.04 Freshwater algae species selection for bioremediation and valorisation in peatlands based trout pond aquaculture

Priya Pollard¹, Roderick Nicholas van Roosmalen¹, Saoirse Hodgins^{1,2}, Veronica Paadin Rogero¹, Julie Maguire¹

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Freshwater algae offer a promising nature-based solution for nutrient recovery and circular bioresource generation within aquaculture systems. This study evaluates their application at the peatland-based Mount Lucas Circular Integrated Multi Trophic Aquaculture (IMTA) demonstration site, aiming to enhance effluent treatment and producing valuable biomass. The CIRCULAR-IMTA-DEMO project focuses on integrated sustainable economic development by demonstrating production of commercial products (TRL 6+) using a holistic multi-actor approach within the Midlands Just Transition territory. The objectives for the algae component are to: select high performing macroalgal species for nutrient removal from trout-pond effluent, develop a scalable prototype system for onsite macroalgae cultivation and assess the potential uses of the resulting biomass based solution for nutrient recovery and circular bioresource generation within aquaculture systems. This study evaluates the nutrient recovery performance of macroalgae found at the CIRCULAR-IMTA-DEMO site and assess the potential uses of the resulting biomass for circular bioresource generation within aquaculture systems. Species screening trials identified elite native strains (*Oedogonium*, *Rhizoclonium*, *Microspora*) for efficient uptake of dissolved nitrogen and phosphorus under variable effluent conditions. Optimising culture conditions to control macroalgal life cycles is ongoing to enable consistent year round biomass production and improved reliability. A prototype freshwater macroalgae recycling system was designed for deployment at Mount Lucas, to facilitate continuous cultivation integrated into the farm's existing water flow. Overall, the preliminary findings highlight the feasibility and multifunctional value of incorporating freshwater macroalgae into IMTA frameworks, supporting both improved environmental performance and the development of new sustainable biomass resources.

S2.05 Transgenerational plasticity and maternal effects in *Daphnia magna* across multiple stressors and (mis)matching environmental conditions

Charlotte Carrier-Belleau, Aisha Kyryk, Pepijn Luijckx, Jeremy J. Piggott

Trinity College Dublin

Anthropogenic activities are increasing the number and intensity of environmental stressors, with major consequences for how organisms adapt and evolve. Because stressor–response relationships are not consistent through time, past environmental conditions can shape future ecological responses through parental effects. These non-genetic influences can either enhance or impair offspring performance, yet most research on transgenerational plasticity has focused on single stressors. In contrast, substantial knowledge gaps remain in multiple-stressor contexts, particularly when offspring experience environments that match or mismatch those of their parents. To address this, we conducted a factorial experiment using three genotypes of *Daphnia magna*, exposing mothers to elevated temperature, elevated salinity, or both combined. Offspring were then reared under all possible stressor combinations, creating matched and mismatched environmental conditions across generations. We quantified key fitness traits, including survival, reproductive output, and time to first reproduction. This study will provide insights into how parental environments influence offspring performance under multiple stressors and varying degrees of environmental matching. This work underscores the importance of incorporating temporal dynamics into multiple-stressor research. As organisms face increasingly variable and unpredictable environments, understanding how stressor legacies influence ecological and evolutionary responses across generations is essential.

S2.06 Population connectivity in the amphipod, *Gammarus duebeni*, among groundwater-dependent systems in the Burren

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Karstic limestone in the west of Ireland channels underground water flow, a potential avenue for gene flow among invertebrate populations in turlough and other groundwater-dependent bodies. The native euryhaline amphipod, *Gammarus duebeni*, is found in North Atlantic marine and adjacent inland freshwater systems; eggs are brooded through hatching in an annual lifecycle. Individuals cling to subsurface vegetation, but can drift in flow, as observed in turlough swallow-hole drainage. We are studying population connectivity in this species among groundwater-fed freshwater sites. We sampled a dozen sites within a ~50 km² area of north Clare, with distant turlough and lake comparisons. Using COI gene sequences, the resulting haplotype network indicates three geographically distinct haplogroups, each of which spans a cluster of sites. While surface-mediated connectivity (e.g., flooding) cannot be excluded, it is assumed groundwater is the predominant mode of migration and gene flow among within-haplogroup sites. Connectivity is demonstrated, but inferred migration distances fall short of dye-study groundwater traces, indicating inherent limits to passive migration in these amphipods. Analyses of additional genes will test these patterns and allow further comparison with previous studies, which found little connectivity among *G. duebeni* populations in surface-fed rivers and lakes across Ireland.

S2.07 Where are all the Yabbies gone?

Pascal Sweeney¹, Bogna Griffin²

¹Sweeney Consultancy; ²Marine Institute

The presence of the Common Yabby, *Cherax destructor*, an Australian crayfish species, was first detected in a lake at a former quarry site at Ballyhass, Co. Cork on 22 March 2019. From that date to 14 June 2023, over 3,500 specimens were caught, mainly in Skanemjarden crayfish traps baited with pork liver and set overnight on 24 occasions. On 04 May 2024, no yabbies were caught in five Skanemjarden traps. On 16 June 2024, no yabbies were caught in traps of smaller mesh size. On 17 June 2024, samples of lake water and sediment taken for eDNA analysis tested negative for crayfish plague but with a weak positive result for yabby. On 30 November 2024 lake water samples were again analysed for eDNA and tested negative for both crayfish plague and yabby eDNA. An underwater drone was also deployed on that date but no crayfish were observed. No yabbies were caught in a refuge trap set on 23 June 2025 and retrieved on 07 July 2025, when a nighttime torchlight search of shallow waters was conducted and no yabbies were seen. From dusk to darkness on 22 July 2025, an underwater drone search of suitable yabby habitat was conducted. Again, no yabbies were recorded. The very large population of *C. destructor* indicated by trapping from 2019 to 2023 collapsed by 2024 and all indications are that this species is now absent from the lake at Ballyhass. However, the reason for this is not clear. Testing did not indicate crayfish plague. There was no report of a spill of a toxic substance. Circumstantial evidence suggested a bloom of cyanobacteria in surface waters in early summer 2024 and 2025 and, in the drone video, a dark film on the lakebed that lifted and broke up as the drone passed was noted. As it was thought possible that this could be a cyanobacterial mat, an attempt to sample this in September 2025. However, a sample suitable for analysis was not obtained. Whatever the cause of their demise, it is fortunate that the yabbies at Ballyhass are no longer a threat to Irish native species and habitats.

S2.08 Large wood habitat in Irish rivers - its role and findings from preliminary fish surveys

Carl Owens

Inland Fisheries Ireland

The aim of the Riverwood project is to evaluate the functional relationships between riparian zones and large wood in rivers in habitat provision for stream biota and to provide an evidence base for large wood augmentation as a restoration tool. Among the key functions of riparian zones is their contribution of large wood (LW) to the river channel, and its influence on channel forms and processes including flow patterns, sediment sorting, retention and routing, which may provide complex physical habitat for stream biota. Preliminary survey results indicate that instream large wood is associated with higher abundances of fish and that larger and more complex structures correlate with higher relative abundances and better representation of fish life stages. While current practice often involves removing wood, river managers should reconsider its importance for fish and other dependent biota. Natural accumulations of LW can promote diverse ecological communities and demonstrate the value of retaining LW to support rich and functionally varied assemblages. The Riverwood project seeks to reconcile conflicting perceptions between rivers that appear untidy yet support strong ecological health, and the degraded ecological conditions often found in uniform, visually tidy channels shaped by human intervention.

S2.09 Unearthing a new approach to gravel extraction: can it restore freshwater fish habitat and improve their population health?

Eva C. De Jong¹, Travis Ingram¹, Nixie C. Boddy², Clement Lagrue^{1,2}

¹Department of Zoology, University of Otago, Dunedin, New Zealand; ²Department of Conservation, New Zealand

Gravel extraction is a widespread commercial activity in New Zealand but poses significant risks to the integrity and functioning of braided rivers. Alternative extraction methods that aim to integrate gravel harvesting with riverbed ecosystem restoration are being trialled. This study evaluated the environmental effects of an experimental gravel and overburden skimming technique designed for restoration, compared with conventional pit mining. Population health indicators—diet composition, parasite load, and growth rate—were assessed in a generalist native fish, the upland bully (*Gobiomorphus breviceps*), across three treatments: pit-mined ponds, restoration sites harvested using gravel and overburden skimming, and unmodified river reaches, all within a section of the Aparima River, New Zealand. Fish from pit-mined ponds exhibited higher parasite loads and faster growth rates than fish from riverine treatments, likely reflecting elevated nutrient concentrations, warmer temperatures, and reduced flow. Minimal differences between restoration sites and unmodified river reaches did not support the anticipated outcomes that the gravel and overburden skimming technique would outperform unmodified reaches; however, our results suggest it is less environmentally disruptive than pit mining. We recommend continued regulation, monitoring, and development of integrative gravel extraction and restoration techniques to enhance ecosystem functioning and support native biodiversity in braided river systems.

S2.10 The Palmerstown sub-catchment in North County Dublin (Fingal): a call to action

Tom McCloughlin^{1,2,3,4}

¹School of STEM Education, Innovation & Global Studies, DCU; ²Water Institute, DCU; ³Centre for the Advancement of Science Teaching & Learning, DCU; ⁴DCU Herbarium (HUUD) & Science Archive, DCU

Palmerstown is a small townland on a low hill in the farmland between Lusk and Balbriggan. It gives its name to a complex stream system which appears to most observers as a field boundary ditch or a relic of the past. In fact, the Palmerstown stream makes up one of the numerous feeding streams into the Rogerstown-Turvey estuary at Rush, and it was the subject of a study in 2019–2023. The author collected biotic and physico-chemical data from stream observations at bridges throughout the catchment at intervals. This paper presents the results of this study. The results show a severely degraded stream where domestic wastewater enters the catchment from single houses along the stream, causing off-scale phosphate levels ($> 0.25 \text{ mg L}^{-1}$); large-scale farm extraction of water for crop watering in summer; channel disturbance and realignment at Lusk; and the channel vertically disconnected from its seaward/downstream end, preventing ingress of biota. However, the stream forms a refuge of *Gammarus duebeni celtica*, which is under threat from displacement by invasive species, and therefore restoring the habitat of the stream would have a positive impact on biodiversity as well as improve the water quality in Rogerstown estuary.

S2.11 The cautious implementation of nature-based solutions to address the multi-faceted pressures on rivers

Darragh Murphy

Flynn Furney Environmental Consultants

Freshwater catchments are assailed by a myriad of pressures from various anthropogenic activities. Certain agricultural activities can simultaneously act as sources of pollutants to watercourses, alter hydromorphology and affect the community composition of freshwater habitats. The Nature-based solutions (NBS) approach can help guide the management of rivers by addressing the specific pressures arising from anthropogenic activities and by re-instating or re-enforcing the hydromorphological and ecological features which have been impacted. NBS features are being rolled out to address issues such as the pollution of rivers from anthropogenic activities, e.g. through formation of run-off treatment features, and to re-instate natural flow-profiles and habitats in rivers, e.g. bank management, riparian planting, large woody structures. Implementation of these features should be done with care, however to avoid issues such as pollution-swapping or unwanted scour in channels. Additionally, for many of these features to be effective, they need to be applied at the catchment scale, requiring catchment scale engagement from landowners. This talk highlights lessons from PhD research on NBS for flood and water quality management, as well as the easy-wins and challenges facing catchment-scale adoption of NBS.

S2.12 Evaluation of the effectiveness of nature-based solutions to reduce the impact on water quality of farmyard runoff

Fulu Zhuang, Simon Harrison, Martha Gosch, William Burchill

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Farmyard runoff can be a significant, but usually unquantified, pressure on surface water quality in agricultural catchments. Targeted nature-based solutions (NBS) are currently being deployed on Irish farms to intercept and treat farmyard runoff before it enters receiving waters. Here, we present preliminary field-based measurements of the water quality within willow filter beds (n=6) and bunded drains (n=2) receiving farmyard runoff, under variable farm management and hydrological conditions. Water sampling consisted of monthly grab samples collected at the mitigation system inlets, internal treatment cells, and outlets, and was analyzed for a range of parameters, including pH, conductivity, dissolved oxygen, total suspended solids, total organic carbon and nitrogen and phosphorus species. Preliminary data indicate pronounced temporal variability in the composition and quantity of rainfall-mobilised farmyard runoff. Notably, runoff had high concentrations of TOC and ammonium, indicating high organic matter enrichment. Early-stage analysis suggested some degree of attenuation of suspended sediment and conductivity across the mitigation systems, but weaker overall impacts on dissolved organic matter and plant nutrients. This study will continue for two years to encompass a range of seasonal and farmyard management conditions, allowing a comprehensive evaluation of the mitigation effectiveness of these nature-based solutions as they mature.

S2.13 Temporary, off-grid, remote, hydrodynamic water quality event monitoring in rivers in the North West of Ireland in the context of more frequent and more intense rainfall events driven by climate change.

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This research examined if temporary, off-grid, remote, semi-continuous monitoring of routine water quality parameters could adequately capture water quality variation over the range of river discharge at a hydrologically active period, and if such monitoring could track the frequency and intensity of hydrodynamic water quality events. High-frequency turbidity, temperature and specific-conductivity were monitored on two rivers from 01/10/2024 to 31/01/2025 and potential water quality events were identified by CANARY event detection system, streamflow and rainfall events were identified by the hydroEvents R-package with subsequent pairing of identified events. The results obtained demonstrate that short duration of semicontinuous monitoring on the Owenmore River provides as much insight into water quality data over the range of river discharge compared to quarterly measurements conducted since 2007. The event analysis 14 rainfall events $\geq 5\text{mm/day}$, with up to 6 streamflow events, and 20 water quality events identified on the River Owenmore, and 4 stream level events in addition to 17 water quality events detected on the River Unshin. For the Owenmore 78% of CANARY water quality events ($n=20$) were paired to rainfall and streamflow events while on the River Unshin 93% of the CANARY events ($n=14$) were paired to rainfall and stream level events.

S2.14 Molecular perturbations of *Daphnia magna* in response to glyphosate – From lab to river

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The freshwater crustacean *Daphnia magna* is one of the most used model organisms in ecotoxicology, particularly in regulatory frameworks. While mortality is the standard endpoint in toxicity testing; more sensitive indicators are required to assess sublethal acute effects of pollutants. This project assessed the changes in the physiology and metabolism of neonates and two generations of *Daphnia* upon exposure to glyphosate in laboratory media and river water collected from a representative site in Dublin. The aim was to generate mechanistic insight into glyphosate's mode of action under environmentally relevant conditions and to identify molecular tools for its detection across a broad concentration range. River water was chemically characterized with hyphenated techniques in collaboration with the UFZ Helmholtz Center for Environmental Research. Mortality, feeding rate, and biochemical markers of physiology including enzyme activities and metabolic perturbations of daphnids were evaluated. The study showed a concentration- and time-dependent decrease of all endpoints assessed upon exposure to the herbicide. The project aimed to revolutionize next-generation risk assessment and to elevate daphnids as an early warning system to monitor and predict aquatic pollution derived from glyphosate, while supporting the replacement of vertebrate animal testing with evolutionarily conserved invertebrate models.

SESSION 3: Elevator pitches (2 min talk + 1 min changeover)

S3.01 Revolutionising the risk assessment of complex cocktails of pollutants with water fleas

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Natural freshwater ecosystems are increasingly exposed to complex mixtures of pollutants, which include metals, pharmaceuticals, and pesticides, etc. The biological effects of these chemicals are insufficiently captured by conventional chemical monitoring. *Daphnia magna*, commonly known as the water flea, is a sentinel species that can link environmental exposure to biological effects and provide an early warning of ecosystem stress. In this study, daphnids were exposed to a six-component mixture of pollutants: glyphosate, propranolol, diltiazem, metformin, nickel, and lithium, under standardised laboratory conditions. Acute and chronic mortality were assessed with toxicity curves and survival plots, respectively. As expected, the mixture was more toxic than the individual pollutants, thus highlighting a synergistic effect. Furthermore, phenotypic endpoints, such as growth, feeding rate and enzyme activities, were assessed. Mixture exposure induced concentration-dependent effects across all endpoints, with evidence of non-additive interactions and detectable sub-lethal enzymatic alterations preceding mortality. There was a clear decline in growth over 7 and 14 days of exposure, while enzymes were reduced dose-dependently. This study supports the development of daphnid-based New Approach Methodologies (NAMs) for improved early warning strategies in freshwater monitoring.

S3.02 The impact of algal food and light on daphnids

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Daphnia magna, commonly known as the water flea, is a model organism widely used in ecotoxicological studies. However, considerable variation exists among laboratories in culturing conditions, including light regimes and food type (i.e. fresh and frozen algae). Such variation may influence the physiology of *Daphnia* and, consequently, its responses to environmental stressors. To determine whether these parameters affect commonly used stress-response metrics, we assessed the impact of food type and light cycle on the lifespan, growth, reproduction, and metabolic profile of *D. magna*. Our results showed that feeding daphnids with frozen algae resulted in slower growth, reduced reproduction, and was accompanied by signs of metabolic restriction. The absence of light led to smaller body size and a distinct metabolic profile, but no differences were observed in the lifespan. The changes may be attributed to circadian disruption and phenotypic changes associated with light deprivation. Together, these findings demonstrate that culturing conditions can significantly influence key life-history traits and metabolic responses in *D. magna*. This highlights the need for greater standardization and transparent reporting of maintenance conditions in ecotoxicological studies to improve reproducibility and comparability across experiments.

S3.03 Growth measurements as a phenotypic endpoint in water fleas

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School of Biotechnology, Dublin City University, Ireland

Conventional water quality monitoring methods lack the sensitivity required to detect sublethal pollution effects and provide limited mechanistic insight into contaminant action. New Approach Methodologies are increasingly adopted as complementary tools that offer sensitive and biologically relevant metrics for pollution assessment. In this context, freshwater sentinel species such as daphnids serve as effective bioindicators of the impact of contaminants. Phenotypic and physiological endpoints constitute a first screening tier for the evaluation of the sublethal chemical effects, with growth measurements representing a robust phenotypic indicator of physiological trade-offs and environmental stress. This study investigated the optimisation and the miniaturisation of a daphnid growth assay to enhance the standardisation and reproducibility of phenotypic testing. Key methodological components, including experimental setup, imaging, and measurement software, were refined with the goal of facilitating integration of phenotypic assays into routine water quality monitoring. Following, the optimised assay was applied to assess the toxicity of common freshwater pollutants. Results demonstrated significant pollutant-induced impairments in daphnid development with decreasing size, thus confirming body-size metrics as a sensitive and non-invasive marker of sublethal stress. This elevates miniaturised growth assays as a practical early-warning tool for the detection of disruption in the ecosystem, advancing biologically based water quality assessment.

S3.04 Nitrate induced oxidative stress on aquatic bioindicators in a controlled microcosm experiment

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Approximately 48% of Irish rivers fail to achieve Good Ecological Status, with national monitoring data indicating a persistent downward trend in water quality over recent years. Agriculture is identified as one of the predominant anthropogenic pressures driving this ecological deterioration. The intensive application of fertilisers contaminates waterbodies, frequently leading to nutrient and pollutant concentrations that exceed regulatory thresholds. Among these, nitrates exhibit elevated levels in 38% of Irish rivers. While the acute toxicity of this ion is relatively low, significant knowledge gaps remain regarding its chronic effects and the induced physiological stress in aquatic communities. Nitrate causes oxidative stress and lipid peroxidation in benthic bioindicators. To evaluate these effects, a controlled microcosm setup will be employed using environmentally relevant concentrations typical of agricultural catchments. The study will assess physiological stress levels in key taxa, specifically Ephemeroptera and Plecoptera, through the analysis of specific biomarkers (SOD, CAT and MDA). The results from this study will contribute to a deeper understanding of contaminant impacts on macrobenthic communities and associated behavioural responses, such as drift. Furthermore, this study will help establish a framework for future investigations into multi-stressor scenarios, specifically the possible synergistic effects of nitrates and pesticides frequently co-occurring in freshwater ecosystems.

S3.05 The potential interactive effects of chemical pollution, heating and drought on integrated constructed wetland biodiversity and ecosystem functioning

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Integrated constructed wetlands (ICWs) are increasingly used for sustainable wastewater treatment across the UK and Ireland. Designed to mimic natural wetland processes and integrate into surrounding landscapes, ICWs provide an ideal setting to examine multiple stressors under natural conditions, with a chemical pollution gradient from inflow to outflow. This proposed study will investigate the potential interactive effects of chemical pollution, heating and drought on ICW biodiversity and ecosystem functioning. A modified 'Marsh Organ' experimental design, following Barry et al. (2023), will apply a fully factorial combination of passive drought and heating treatments to mesocosms positioned along the pollution gradient. Marsh organs will be deployed during summer for 4-6 weeks. Benthic invertebrate and microbial communities will be sampled to determine diversity and composition while ecosystem functioning will be quantified as invertebrate-driven decomposition rates and microbial nitrogen cycling. Water chemistry across ICWs will be assessed, focusing on nutrients, pharmaceuticals and personal care products, in addition to water quality parameters. The experiment will be repeated across multiple ICWs in the UK and Ireland to explore context dependencies related to ICW characteristics. This study will advance understanding of potential multiple stressor interactions in wetland ecosystems and inform ICW management and natural wetland conservation.

S3.06 Monitoring and assessing the effectiveness of ecological water quality restoration measures

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Agriculture had been a cause of significant issues in water quality across Ireland. Nutrient and sediment run-off from fields and yards can cause negative impacts on water quality, effecting not only biodiversity, but also recreational and commercial value of lakes and rivers. The implementation of large scale nature based solutions (NbS) to intercept run-off in rural and urban areas has been proven to improve water quality in downstream waterbodies, while also providing biodiversity benefits and visual appeal. However, large scale NbS systems can cause conflict regarding long term management and ownership. Therefore, small scale NbS systems implemented at an individual farm level as part of agri-environmental schemes may have the potential to locally improve water quality, resulting in catchment wide benefits depending on number of systems installed in one area. Wetland ponds are one such small scale NbS systems, mimicking natural pond habitat, that can be installed in wet, unproductive areas within a farm site. These ponds can provide sediment storage via settling within the pond basin, and nutrient uptake through the growth of aquatic and riparian vegetation, potentially improving water quality in downstream waterbodies, with biodiversity also being increased on site through the creation of new wetland habitat.

S3.07 Improving water quality in cross border catchments through nature-based solutions and community actions to meet Water Framework Directive goals

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Many of Ireland's freshwater bodies still fail to reach 'good ecological status' under the Water Framework Directive despite ongoing efforts, highlighting the need for targeted catchment scale work. According to the EPA, just 52% of our surface waters were in satisfactory condition, which is a deterioration from the previous monitoring period from 2016-2021. FLOW (For Love of Our Waters) is a three-year cross border project (2025-2028) funded by SEUPB under the PEACEPLUS programme that seeks to protect and restore specific lakes and rivers in cross-border regions. The project focuses on four target catchments that lie on the border: Lough Melvin, Lough MacNea, Swanlinbar/Cladagh River and the Kilroosky/Magheraveely Lake Cluster. The project aims to address declining water quality in these priority catchments by looking at agricultural pressures, wastewater discharge, soil erosion, surface run off, control and prevention of invasive species and improving health. An important part of the project will focus on monitoring water quality by measuring nutrient loads (N and P), an assessment of baseline data and subsequently evaluating improvements in water quality following the implementation of riverine Nature-Based Solutions (NBS) and analysing for blue green algae (or cyanobacteria) and their toxins. Extensive water sampling and lab-based analyses will be carried out, which will make use of various approaches such as the application of biological indicators like macroinvertebrates, fish and environmental DNA (eDNA), the acquisition of physico-chemical data and the promotion of community engagement through citizen science. Although the project is at an early stage, FLOW is designed to deliver measurable improvements in water quality, strengthened cross-border cooperation, and increased engagement of local stakeholders to protect and manage water resources. This poster outlines the project's plans and anticipated contributions to the delivery of the 3rd Cycle River Basin Management Plans (2021-2027).

S3.08 Balancing ecological flow requirements and water abstraction pressures in Irish river systems

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Sustainable water abstraction must balance human demand with the ecological flow requirements necessary to maintain healthy freshwater ecosystems. In Ireland, increasing pressures from public supply, agriculture, and climate variability are intensifying the need for robust, science-based approaches to environmental flow management. This project evaluates ecological flow thresholds across selected Irish catchments using hydrological indicators and biological response data. We aim to assess the impacts of varying abstraction scenarios on flow regime alteration and key ecological indicators e.g. macroinvertebrate communities. Results are expected to highlight strong seasonal sensitivities, with low-flow periods presenting the greatest ecological risk. Our findings are expected to further inform ecological flow standards in abstraction licensing and catchment planning, emphasising the importance of adaptive

management under future climate uncertainty. The work contributes practical insights for implementing environmental flows in Ireland and aligns with wider European objectives for protecting riverine ecosystems while ensuring water security.

S3.09 Understanding 'Hydrocitizenship' and the F.L.O.W. (Future Leaders of Water) framework

Deign Frolley Soriano, Mary Kelly-Quinn, Jan-Robert Baars

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Small streams are one of the most extensive yet least monitored freshwater ecosystems of Irish catchments which often fall through the cracks of Water Framework Directive (WFD) assessments. While decentralised efforts such as Citizen Science monitoring offers a solution to these water quality data gaps, its success is frequently hindered by multiple gaps including motivation, behavior, implementation, and integration deficits. My current work explores the human dimensions of freshwater science: the motivations, behaviors, and knowledge that turn a volunteer into a lifelong steward. I aim to align these personal dimensions with rigorous scientific validation of how they conduct water quality assessments in small streams to close the loop between grassroots action and national policy frameworks for freshwater management and governance. I envision to understand and provide a dynamic framework to hydrocitizenship to strengthen the small but meaningful contributions of the public into policy-grade evidence that can inform and drive the recovery of our freshwater ecosystems for the long haul.

S3.10 Silent spreaders: the new demon shrimp invasion

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The so-called “demon shrimp”, *Dikerogammarus haemobaphes*, was first detected in Ireland in September 2025, marking the arrival of another high-risk Ponto-Caspian invader. Its close relative, *Dikerogammarus villosus*, has been on Ireland’s invasive species horizon list, but the demon shrimp should be considered as equally ‘high risk’. Recent surveys across the Shannon catchment and connected canal networks indicate that *D. haemobaphes* is now widespread throughout the River Shannon system, occurring in both lake and river habitats. It is likely to have arrived in the lower Shannon with the widest and highest densities occurring in Lough Derg. Isolated populations in the Royal Canal, Grand Canal, and Shannon–Erne Waterways suggest secondary spread associated with boat traffic, indicating its likely future spread to connected water bodies. Ecological impacts are likely to be significant: at estimated densities exceeding 1,300 individuals per m², *D. haemobaphes* was often the only amphipod present, displacing native species such as *Gammarus duebeni* and *Gammarus lacustris*. A key diagnostic feature for field identification is the presence of two distinctive “volcano-like” projections on the dorsal surface of the urosome, visible to the naked eye, enabling rapid recognition of this emerging invader.