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Atlantic  
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Irish Freshwater Sciences Association 2023**  
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## **Book of Abstracts**

(In order of speaker presentations)

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## SESSION 1A (12 MIN TALKS)

### Bernie White – LAWPRO

#### River Basin Management Planning – a look back at the 2<sup>nd</sup> cycle & planning for the 3<sup>rd</sup> cycle,

(Dr Bernadette White, Regional Co-ordinator, Local Authority Waters Programme)

Ireland's draft River Basin Management Plan 2022-2027 sets out the need for "*a sincere collective effort as well as the time and space given over to collaborative activities*"<sup>1</sup> to meet the challenge of protecting and improving Ireland's water quality and to maximise co-benefits for addressing climate change and biodiversity loss. The EPA has reported that slightly more than half (54%) of Ireland's waterbodies are *At Risk* of not meeting the mandatory environmental objectives of the Water Framework Directive by 2027. The evidence presented in the latest Water Quality in Ireland report clearly shows that the goal of restoring all waters to good status or higher by 2027 will not be achieved. While improvements in water quality have been recorded e.g., higher rate of improvements noted in Priority Areas for Action, these are being cancelled out by declines occurring elsewhere. A number of actions are now required in order to make better progress, and these include a firm commitment to address the main pressures on water quality – agriculture, hydromorphology, forestry and waste water, and greater coherence and integration across national programmes and policies which could impact on water quality by Government departments and relevant state bodies<sup>2</sup>. This talk will look at the core sectoral areas where impacts increased/decreased in the 2<sup>nd</sup> cycle (2018 – 2022), and looks forward to Catchment Management Planning for the 3<sup>rd</sup> cycle.

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<sup>1</sup> Pg 9, DHLGH, [Draft River Basin Management Plan for Ireland: 2022-2027](#).

<sup>2</sup> EPA. Summary Report Water Quality in Ireland 2016 – 2021. [WaterQuality\\_SummaryReport.pdf \(epa.ie\)](#)

## Luca Mirimin - ATU

### **Environmental DNA (eDNA) as a new tool for the detection and monitoring of aquatic species in Irish freshwater systems**

(Marine and Freshwater Research Centre, School of Science and Computing, Department of Natural Resources & the Environment, Atlantic Technological University, Galway, Ireland.)

Environmental DNA (eDNA) refers to any DNA molecule that can be retrieved from an environmental sample such as water, sediment/soil or biofilm. Virtually all organisms shed traces of their DNA into the surrounding environment via faeces, sloughed cells, gametes, etc., which will persist for some time before degrading beyond recognition. eDNA methodologies generally involve three main steps: (i) collection of an environmental sample; (ii) extraction of bulk eDNA; and (iii) identification/quantification of genetic material belonging to specific taxa of interest. The latter step can be performed either by targeting single species/strains by means of quantitative real-time PCR (qPCR) or digital PCR (dPCR), or by targeting whole communities by means of High Throughput Sequencing (HTS) technologies (i.e., eDNA metabarcoding). While limitations to its adoption in regular monitoring programmes still exist, eDNA has become an extremely valuable tool for the detection and monitoring of aquatic species especially thanks to its time and cost efficiency. Examples of eDNA studies carried out in Irish freshwater systems will be presented, including applications to surveillance of water-borne pathogens, such as the crayfish plague (*Aphanomyces astaci*), as well as fish community profiles encompassing protected salmonid species (Arctic char (*Salvelinus alpinus*) and Irish pollan (*Coregonus autumnalis*)).

## **Bogna Griffin – Marine Institute**

### **Environmental DNA (eDNA) Surveillance of Crayfish Plague, potential vectors, and White-clawed crayfish in Ireland, a National Monitoring Program.**

Bogna Griffin<sup>1</sup>, Brian Nelson<sup>2</sup>, Ciar O'Toole<sup>1</sup>, Teresa Morrissey<sup>1</sup>, Samantha White<sup>1</sup>, Deborah Cheslett<sup>1</sup>, Bill Dore<sup>1</sup>, Fiona Swords<sup>1</sup>

(<sup>1</sup>Marine Institute, Galway, Ireland, <sup>2</sup>NPWS)

Since 2015, several crayfish plague (CFP) outbreaks have decimated White-clawed crayfish (WCC) populations in several Irish river systems. In response to the spreading plague, an environmental DNA-based national surveillance programme was established in 2018 as a collaboration between the National Parks and Wildlife Service and the Marine Institute. This study aimed to understand further and monitor the CFP outbreaks in Ireland, potential vectors, and CFP impact on the native crayfish populations. eDNA surveillance has proven to be very successful. The results of both programmes show a rapid spread of CFP within and between catchments, with positive CFP detections in 15 out of 27 catchments surveyed. Genotyping of CFP-positive samples suggests multiple possible introduction pathways are possible with multiple genotypes present. However, the overall WCC population remains largely healthy in many catchments despite the continued threat of plague. Only two of the 27 surveyed failed to record a single WCC-positive site in both the 2018-2019 and 2020-2021 cycles. To date, DNA from potential vector crayfish species has not been detected in any eDNA samples tested from CFP-positive catchments.

## **Róisín Nash – ATU**

### **Sources, Pathways and Environmental Fate of Microplastics in Freshwater Ecosystems**

Róisín Nash<sup>1</sup>, John O'Sullivan<sup>2</sup>, Sinead Murphy<sup>1</sup>, Michael Bruen<sup>2</sup>, Anne Marie Mahon<sup>1</sup>, Heather Lally<sup>1</sup>, Linda Heerey<sup>1</sup>, James O'Connor<sup>1</sup>, Xiaodi Wang<sup>2</sup>, Ian O'Connor<sup>1</sup>.

(<sup>1</sup>Atlantic Technological University, Galway, <sup>2</sup>University College Dublin)

The identification of microplastic (MP) sources in river catchments is key to facilitate management efforts to reduce their presence in aquatic environments. Results from this project have identified several sources of MPs to rivers including the spreading of sludge (biosolids) following primary treatment WWTPs onto agricultural land, the construction industry, through the onsite cutting of plastics materials, and artificial pitches, through wear and tear.

The identification of pathways including the processes that govern the overland movement of MPs are complex, but research presented here shows that the concentrations of MPs exported can be influenced by catchment slope and rainfall intensity. In addition, ploughing has been confirmed to contribute to the vertical migration of MPs. Furthermore, spatial, and temporal changes play an important role in the concentration and bioavailability of floating MP in rivers.

Within the riverine system, the fate of MPs is again varied and complex with MPs present in sediment and all of the riverine macroinvertebrate families examined. MPs were also recovered from brown trout (72%) and otter spraints (53%).

Research results presented here, together with recommendations will work towards helping to mitigate and reduce microplastics within riverine systems.

## SESSION 1B (12 MIN TALKS)

### Giovanni Cappelli – ATU

#### **Physicochemical characterisation and biological communities assessment of protected lake habitats in Ireland: Determining their conservation needs.**

Giovanni Cappelli<sup>1</sup>, Emma Gray<sup>1</sup>, Martin Gammell<sup>1</sup>, Cillian Roden<sup>2</sup> and Heather Lally<sup>1</sup>

(<sup>1</sup> Marine and Freshwater Research Centre (MFRC), Atlantic Technological University, Dublin Road, Galway City, Ireland. <sup>2</sup> Roden Ecology, Kinvara, Co. Galway)

Despite being protected under Annex I of the EU Habitats Directive, oligotrophic lake habitat (code 3110) and dystrophic lake habitat (code 3160) are in bad and inadequate conservation status respectively. Several pressures are responsible however, a lack of knowledge is preventing appropriate conservation status assessment. To describe such habitats and characterise their reference state, 17 water chemistry parameters were recorded in 24 waterbodies from three different sites during spring and summer 2021 while, samples of Odonata larvae and Coleoptera were collected by net sweepings method. Most waterbodies are oligotrophic and acidic with low alkalinity, conductivity and medium levels of colour. In terms of Odonata and Coleoptera community structure, a total of 55 species were found, with Dytiscidae the dominant family. 3110 lake habitat was more diverse and dominated by Coenagrionidae larvae such as *Ischnura elegans* and *Pyrrhosoma nymphula*, whereas 3160 lake habitats were characterised by the *Gyrinus* genus. Multivariate analysis depicted a separation where most 3160 were associated with Dytiscidae family while 3110 included a larger variety of species and families. Moreover, a redundancy analysis further expressed groupings and indicated water colour, temperature and dissolved oxygen as the main drivers of community separation.

## **Pascal Sweeney – Sweeney Consultancy**

### **Population Structure and Reproduction of the Australian Common Yabby in an Irish Lake**

Pascal Sweeney<sup>1</sup>, Oli Cwikula<sup>2</sup> and Thiha Kearney-O'Sullivan<sup>2</sup>.

(Sweeney Consultancy<sup>1</sup>, Colaiste Treasa<sup>2</sup>)

The Common Yabby, *Cherax destructor*, is an Australian crayfish species that was first found in Ireland in 2019 at a former quarry lake at Ballyhass, in north Co. Cork. A year-round study in 2021-2022, with trapping of adults approximately fortnightly, and other methods used to catch juveniles, revealed some interesting differences in the population structure and reproduction pattern here, compared to data from their native range in south-eastern Australia.

Trapping results indicate a far higher than expected proportion of females in the Ballyhass population. Sexual maturity takes longer here than in Australia. While female yabbies generally breed at least twice per season in Australia, only a single breeding period was recorded at Ballyhass. The implications of these results are discussed.



**Jan-Robert Baars - UCD****Quagga replacing zebra mussel and extending impact on lakes and rivers.**

Invasive Ecology (InEco) Laboratory, School of Biology and Environmental Science, UCD, Science West, Belfield, D4

It appears that the aquatic invasive alien bivalve *Dreissena rostriformis bugensis*, otherwise known as the quagga mussel has been in Ireland since at least 2017. Many inland water bodies have seen the initial explosive establishment and subsequent reduction of the Zebra mussel as it spread in Ireland. Attached to hard substrates the Zebra mussel reached extremely high densities and biomass and through filtering led to associated changes to lakes in particular. Surveys conducted in 2021 & 2022 indicate that the quagga mussel is rapidly expanding its range and where it co-occurs seems to consistently outcompete Zebra mussels. Densities (40 000 ind/m<sup>2</sup>) are similar to when zebra mussel were at their peak but the establishment on soft sediments, as indicated by their invasion elsewhere in the world, is a real cause for concern. Monitoring results indicate that the quagga is establishing very high densities on soft sediments both in lakes (even at depth) and the river channel. Impact is likely to be worse than zebra mussel as a result and preventing the movement to unconnected water bodies should be a priority.

## **Elvira de Eyto – Marine Institute**

### **Captive breeding of Freshwater pearl mussels in Ireland – progress so far at the Marine Institute hatchery.**

Elvira de Eyto<sup>1</sup>, Fintan Egan<sup>1</sup>, Alan Drumm<sup>1</sup>, Evelyn Moorkens<sup>2</sup>, Ian Killeen<sup>2</sup> and Richard O’Callaghan<sup>3</sup>.

(<sup>1</sup>Marine institute, Furnace, Newport, Co. Mayo, <sup>2</sup>Moorkens & Associates, Greystones, Co. Wicklow, <sup>3</sup>NPWS, 90 King Street North, Smithfield, Dublin 7).

Freshwater pearl mussels (FPM) (*Margaritifera margaritifera*) are bivalve molluscs that are native to Irish rivers and lakes. The species is protected under the Wildlife Act and listed on Annex II and V of the EU Habitats Directive. The species is on the verge of extinction, in unfavourable bad conservation status and categorised as critically endangered in Ireland, and one of the 365 most endangered species in the world. The National Conservation Strategy for the Freshwater Pearl Mussel recognises the importance of captive breeding projects for ensuring the short- to medium-term survival of populations in severe decline. In 2019, the National Parks and Wildlife Service (NPWS) approached the Marine Institute to explore the possibility of using the facilities at the Marine Institute’s research station in the Burrishoole catchment, Furnace, Newport, Co. Mayo as a captive breeding facility. Here, we detail progress so far with a 2020 cohort of FPM derived from adults from the Newport River and outline our plans for the 2022 and 2023 cohorts. In 2020, successful spawning and glochidiosis was achieved, and these juveniles are now approximately ~3 mm. The 2022 cohort is currently at the glochidiosis stage, and plans for 2023 include a salmon vs trout comparison.

## **SESSION 2 (7 MIN TALKS)**

### **Dave Wall - NBDC**

#### **Dragonfly Ireland 2019 – 2024: Exploring climate driven change in dragonfly and damselfly range and flight period using Citizen Science data.**

(National Biodiversity Data Centre)

Dragonfly Ireland 2019 – 2024 is an all-Ireland survey run jointly by the National Biodiversity Data Centre (NBDC) and the Centre for Environmental Data and Recording (CEDaR) in Northern Ireland. It is the second all-Ireland survey of dragonflies and damselflies, the first was conducted in 2000 – 2003. Records are received from Citizen Scientists via the NBDC and CEDaR websites, with additional records contributed by expert recorders, and gathered during sites surveys by field ecologists. Since 2019, 17,263 validated records of 29 species have been contributed to the project. Analysis of these data indicate that climate change has had an impact on the range and flight period of a number of Irish dragonfly and damselfly species over the past 20 years. Two species (Migrant Hawker and Emperor Dragonfly) which had a limited southern distribution in the 2000 – 2003 survey showed significant range expansion north-westwards across Ireland in the intervening 20 years. A shift in flight period was observed in 63% of dragonfly and damselfly species analysed. The results to date show that Citizen Scientists can generate robust data which can be validated, and which contributes to our understanding of the impacts of climate change on freshwater macroinvertebrates in Ireland.

**Helen M. Barber-James – Ulster Museum****Preliminary studies of Ephemeroptera, Plecoptera and Trichoptera (EPT) taxa in Northern Ireland.**

Helen M. Barber-James and Andrew Kenny

(Ulster Museum, National Museums Northern Ireland, Belfast, Northern Ireland)

The species level diversity of the important environmental indicator taxa Ephemeroptera, Plecoptera and Trichoptera has received little focus in Northern Ireland. New studies are being undertaken to build up stronger baseline data. A preliminary study has focused on the Ballinderry River and its tributaries. The project will expand to investigate species diversity at selected freshwater sites across Northern Ireland, including rivers, lakes and other significant waterbodies such as the peculiar water-filled fen depressions on Rathlin Island. Rather than use existing river monitoring sites used, we will focus on more remote sites where species are under-recorded. We aim to choose sites in the major geological zones of the country, as ecological conditions are fundamentally affected by the underlying geology. This will allow us to get as broad a representation of species diversity as possible, especially of rare and threatened species. Climate change is causing changes in seasonality, affecting emergence times of adults, and cold-adapted species are retreating to higher altitudes where they cling to existence. Our work will help to determine which species are now severely threatened, and will feed into the priority species list of Northern Ireland, of relevance to all Ireland. It has potential to contribute to species red- listing.

## **Eithne Davis -ATU**

### **Invasive Alien Species: Improving understanding and communication**

Eithne Davis<sup>1</sup>, Dolores Byrne<sup>1</sup>, Helen Roy<sup>2</sup>, Frances Lucy<sup>1</sup>

(<sup>1</sup>Atlantic Technical University, <sup>2</sup>UK Centre for Ecology and Hydrology)

Preventing invasive alien species (IAS) from being introduced and spreading through good biosecurity measures is far more cost-effective than managing and eradicating established infestations. Despite campaigns specifically developed for the sector, anglers and angling organisations often lack understanding of the impacts IAS can have on the aquatic ecosystem. Stakeholders have little experience of working in partnership on IAS and of communicating around biosecurity measures to prevent their introduction and spread.

This project centres on communication around IAS over a range of clusters groups. One of these clusters, Aquatic Recreation (angling), engages key stakeholders across the EU to develop relevant and accessible materials which communicate the risks around IAS and the actions which should be taken to prevent their spread.

Through a series of interviews and meetings, a communications strategy has been developed, and the Aquatic Recreation stakeholders involved are acting as amplifiers to bring consistent, reliable and trustworthy messages on IAS to their own specific audiences.

This work is being undertaken in support of the implementation of the EU's 2020 Biodiversity Strategy, in particular Target 5, as well as Regulation (EU) 1143/2014 on the prevention and management of the introduction and spread of invasive alien species (the IAS Regulation).

## Daire Ó hUallacháin - Teagasc

### A riparian mitigation measures selection tool

Daire Ó hUallacháin<sup>1</sup>, Nikki Baggaley<sup>2</sup>, Fabiola Barros Costa<sup>1</sup>, Allan Lilly<sup>2</sup>, Mark Wilkinson<sup>2</sup>, Marc Stutter<sup>2</sup>

(<sup>1</sup>Teagasc, Wexford, Ireland, <sup>2</sup>The James Hutton Institute, Craigiebuckler, Aberdeen, UK)

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The establishment of riparian mitigation measures to enhance the delivery of ecosystem services, and the protection of water quality in particular, have been in existence nationally and internationally for decades. Significant efforts have been made to develop tools to support targeting of riparian mitigation measures (*Right Place*), culminating in the development of the EPA Pollution Impact Potential (PIP) Flow Delivery Paths and the PIP Flow Delivery Points. It is important that tools that help to identify the *Right Measures* are also developed, thus supporting the principles of *Right Measure: Right Place*.

The SMARTER\_BufferZ project developed a riparian mitigation measures tool, to help identify optimum buffer design and management options, for a given set of local biophysical factors. The tool functions by guiding the user through a set of questions on: the landscape; runoff and erosion pressures; and pollution pathways, to target edge of field mitigation measures. Answers to these questions inform prioritisation or rejection of measures, from a suite of sixteen measures suitable for the riparian space.

Developments in relation to identifying and assessing riparian mitigation measures, coupled with development of tools to support targeting of measures can help inform future projects and schemes addressing water quality and delivery of wider ecosystem services.

## **Darragh Murphy -UCC**

### **Nature-based Catchment Management Solutions in practice on an Irish Farm**

(University College Cork)

Over recent decades, changes in farming practices have altered the hydrological nature and flux of nutrients and sediment through Irish catchments. Land drainage works have increased the hydrological conveyance of stream channels and have reduced the extent of flood-storage areas during rain events. Additionally, higher stocking densities of livestock create greater reservoirs of nutrients and sediment from risk areas of farms such as track-ways, exposed soils and hard-standings; putting adjacent water bodies at risk. Enhancing hydrological and nutrient retention in the agricultural landscape have become key aims of regional and national. Nature-based Catchment Management Solutions (NbCMS) are advocated for mitigating the effects of modern agriculture and climate change on rivers.

Recent evidence for the effectiveness of a range of NbCMS on management of flood peaks and water quality pressures on a farm in Co. Cork is presented here. These measures include off-line and in-stream Runoff Attenuation Features (RAFs). Hydrological and water quality data have been collected and analysed to assess the impact of the RAFs on stream hydrology and nutrient status. We discuss the potential for measures such as the RAFs to mitigate the pressure on flooding and nutrient fluxes posed by contemporary agricultural practices, without diminishing agricultural pasture productivity.

**Marcin Penk - TCD****Combined impact of climatic and land-use stressors on stream algae – preliminary findings from a field mesocosm experiment**

Marcin Penk<sup>1</sup>, Ann-Marie Kelly<sup>1</sup>, Aishaani Sharma<sup>1</sup>, Mary Kelly-Quinn<sup>2</sup>, Jeremy Piggott<sup>1</sup>

(<sup>1</sup>Trinity College Dublin, <sup>2</sup>University College Dublin)

Ecosystems are increasingly challenged by the multiple facets of climate change, coupled with intensifying land-use pressures. These co-occurring stressors can potentially interact in complex ways yielding 'ecological surprises', but we lack an empirical understanding and predictive framework for individual and interactive effects. Using 128 flow-through circular stream mesocosms in Co. Wicklow, Ireland (ExStream system), we investigated the effects of two climatic stressors (CO<sub>2</sub> enrichment, increased flow variability) and two land-use stressors (siltation, riparian shading removal) on algal communities in a well-replicated, full-factorial design. Algal biomass determination by fluorescence showed that sediment pulses had a profound impact on algal biomass and temporal dynamics. Lack of shading promoted cyanobacteria and reduced green algae. Flow regime was only marginally important on its own but regulated the effects of other stressors. CO<sub>2</sub> enrichment was important temporarily and depending on other conditions. Further algal analyses are underway to tease out these effects.



**Aoife Robertson -TCD****An examination of nonlinearities and interactions of biological responses to multiple stressors**

Trinity College Dublin

Despite evidence that threats to freshwater ecosystems involve linear and nonlinear stressors which often interact with one another, current stressor-response research focuses overwhelmingly on linear, single-stressor models. Here we aimed to improve stressor-response models through the inclusion of nonlinearity and interactions. Physicochemical and biological data from 182 river sites were collected by the EPA as part of their biomonitoring data collections between 2007 – 2018 in the Republic of Ireland. This dataset was used to model stressor-response relationships and interactions, using invertebrate (EPT richness, Q Value), diatom (Trophic Diatom Index, diatom diversity, diatom richness) and macroalgal (macroalgae abundance, cladophora abundance) response variables. Results showed that the inclusion of nonlinearity and interactions improved the models for all but one biological response, the implications of which are still being assessed.

## **Emma Gray / Heather Lally - ATU**

### **Using desmids as an indicator of conservation status for dystrophic lake habitats in western Ireland**

Emma Gray<sup>1</sup>, Giovanni Cappelli<sup>1</sup>, Martin Gammell<sup>1</sup>, Cilian Roden<sup>2</sup> and Heather Lally<sup>1</sup>

(<sup>1</sup>Marine and Freshwater Research Centre, Atlantic Technological University, ATU Galway City, Galway, Ireland, <sup>2</sup>Roden Ecology, Kinvara, Galway)

Dystrophic lake habitats (code 3160) are unique, and support threatened and rare freshwater species. This habitat type is protected under the EU Habitats Directive, but currently has an inadequate conservation status in Ireland. Conservation status under the Habitats Directive is assessed primarily using macrophyte assemblages but a characteristic feature of dystrophic lakes is scarce macrophyte coverage. Desmids (microscopic algae), however, are abundant in peatland lakes, and may offer a suitable alternative. Here, we tested the suitability of desmids as an indicator of conservation status by performing spring and summer surveys in 2021 for planktonic (38 µm net) and benthic (sphagnum squeezes) desmids at 24 waterbodies, located over two Special Area of Conservation (SAC) (Connemara and Owenduff/Nephin). Three desmid indicators were used to assess conservation status: (1) Nature Conservation Value, (2) the number of rare species according to previous surveys in Ireland, and (3) the number of red list species (Netherlands and UK). The conservation metrics performed consistently and demonstrated a moderate to high status for most waterbodies sampled. There were regional differences, with Connemara lakes having a higher conservation status compared to Owenduff/Nephin. These results support the suitability of desmids as an indicator of conservation status for 3160 lake habitats.

**Cilian Roden - ATU****Are Erosion Patterns in Limestone Rock an Indicator of Marl Lakes?**

Cilian Roden<sup>1</sup>, Philip Doddy, Dan Minchin and Paul Murphy

(<sup>1</sup>Atlantic Technical University)

A recent extensive study of Irish marl lakes showed that a shallow water zone of cyanobacterial crust was a constant feature of marl lakes on Carboniferous limestone in good conservation condition. Underwater field survey has shown that this crust which can cover all exposed rock, also erodes limestone in lakes such as Carra or Muckanagh. In some lakes (Corrib, Mask), removal of the cyanobacterial crust reveals a pattern of hollows and pinnacles etched in the rock, termed “egg box” weathering. In less calcareous lakes with exposed limestone bedrock (Muckross, Eske) the crust does not occur nor is etched rock recorded. We propose that rocks with “egg box” weathering indicate the present or former occurrence of the cyanobacterial crust and hence marl lake conditions.

In 2023, funded by NPWS, we tested this hypothesis, in Lough Derg. At underwater locations we found a thick calcareous deposit blanketing underlying limestone bedrock. Microscopic examination suggests that the deposit is dead cyanobacterial crust. The deposit is underlain by decaying limestone and rocks with eggbox weathering were noted around the lake. We propose that the now mesotrophic Derg was once a clearer water marl lake.

**Áine O'Connor - NPWS****NPWS Update on freshwater and wetland habitats and species**

Áine O Connor, Richard O'Callaghan and Brian Nelson

(National Parks and Wildlife Service)

This short talk will highlight some of Ireland's most endangered freshwater species and habitats, and completed and on-going work on these by the National Parks and Wildlife Service, Ireland's nature conservation authority. Seven of Ireland's eight freshwater habitats protected under the Habitats Directive are in unfavourable conservation status, and six of the ten species (<https://www.npws.ie/publications/article-17-reports>). Regional red lists published for animal groups show that 158 wetland species in Ireland are threatened with extinction (<https://www.npws.ie/publications/red-lists>). Land-use change and intensification is a major driver of these declines, through direct destruction of freshwater habitats (particularly wetlands), hydrological change and increased water pollution. Understanding the ecological requirements of individual species, habitats and sites is of paramount importance to the design, implementation and monitoring of measures to restore freshwater and wetland habitats and species (e.g. see Irish Wildlife Manuals at <https://www.npws.ie/publications/irish-wildlife-manuals> and the Burren Invertebrate Conference report and recordings at <https://www.npws.ie/research-projects/animal-species/invertebrates>).

**SESSION 3 (ELEVATOR PITCH 2 MIN)****Osato Idelegbagbon - DCU****Development of CRISPR-Based Assays for the Detection of Irish Freshwater Fish Species**

(Dublin City University)

Freshwater environments and the many species that reside within them are increasingly in need of monitoring and protection. The ability to detect and monitor threatened/vulnerable species within these environments is of great importance and the novel RPA-CRISPR-Cas assays being designed and utilised as part of my PhD research can achieve this. The assays are designed with a specific focus of targeting eDNA of Irish freshwater fish species.

RPA-CRISPR-Cas assays incorporate target DNA amplification under isothermal conditions (specifically RPA) and highly specific detection based on fluorescence signal outputs utilising CRISPR. The designed assays are species-specific with the main benefits including: a non-invasive method of monitoring target species, time saved compared to traditional methods and reduction in disruption caused to target habitats. Along with this, the use of an isothermal amplification method removes the added cost and complexity usually associated with qPCR.

Further from this, we aim to develop and adapt this novel assay for on-site application with a vision for eDNA detection utilising LFA strips. This will in turn broaden the scope of end users for our developed assays allowing a non-specialist to be able to accurately detect presence/absence of specific freshwater fish species.

**Emily Rick -UCD****Project title: Investigating hydromorphology in intensively farmed grassland catchments under a changing climate**

Emily Rick<sup>1</sup>, Dr Jonathan Turner<sup>1</sup>, Dr Per-Erik Mellander<sup>2</sup>

(<sup>1</sup>University College Dublin, <sup>2</sup>Teagasc)

Hydromorphological modifications such as river straightening and deepening, combined with the land use pressures from agriculture have resulted in significantly degraded river habitats across Ireland. Consequently, many rivers have been identified for targeted river restoration measures going forward as required under the European Water Framework Directive (WFD). It is increasingly recognised that successful river restoration initiatives must target both the catchment-scale pressures as well as the hydromorphological form. This study will aim to provide a robust evidence base for the restoration and enhancement of two catchments, both lowland river catchments in Ireland that have been heavily impacted by hydromorphological alteration and agricultural land use pressures. Firstly, hydromorphological processes and process-response relationships will be characterised for both catchments at multiple scales. Following characterisation, a conceptual model of historic change will be built based on known changes to river form and catchment processes. Thirdly, catchment and reach-scale modelling will be undertaken using the CAESAR-Lisflood LEM in order to predict how the catchment may respond under future scenarios of climate change (developed under the WaterFutures project) and in combination with established river restoration techniques. Finally, the impact of restoration scenarios on physical habitat will be measured using WFD metrics and broader understanding of hydromorphological change.

## **Dieu Anh Dinh -DKIT**

### **Remote Sensing of Global Surface Waters – RETINA**

Dieu Anh Dinh<sup>1</sup>, Eleanor Jennings<sup>1</sup>, Valerie McCarthy<sup>1</sup>, R. Iestyn Woolway<sup>2</sup>,

(<sup>1</sup>Centre for Freshwater and Environmental Studies, Dundalk Institute of Technology, Dundalk, Ireland, <sup>2</sup>School of Ocean Sciences, Bangor University, Menai Bridge, Anglesey, UK)

Climate change is considered one of the most severe threats to lake ecosystems worldwide. Some of the primary physical responses of lakes to climatic variations are those which occur at the lake surface, including changes in ice cover, lake surface water temperature, lake colour, and water level/extent; known collectively as Lake Essential Climate Variables (ECVs). These Lake ECVs have changed dramatically in recent decades and, consequently, have had numerous implications for lake ecosystems and the ecosystem services they provide. However, climate change responses in lakes have only been studied on a site-by-site basis. Monitoring these Lake ECVs on a global scale has recently commenced by the European Space Agency's Climate Change Initiative (CCI). The Lakes CCI project is currently generating the first consistent and long-term time series from lakes worldwide covering all Lake ECVs. These satellite data have great potential to provide a comprehensive and consistent picture of the world's lakes, as well as their responses to climatic variations. This study will take advantage of these novel satellite observations and investigate the effects of climate change on Lake ECV worldwide. The outputs will provide improved knowledge on how climatic change affects lake ecosystems and the ecosystem services.

## **Yanika Rhule - UCD**

### **The Hydromorphological and Ecological Impacts of Forestry Operations on Rivers in Ireland**

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This research is being conducted as a part of the DAFM-funded Hydrological and Sediment Impacts of Forestry Operations on Rivers in Ireland (HydroSED) project. Only 53% of the rivers in Ireland achieved at least good ecological status from 2013 to 2018, and 41% are at risk of not achieving good status by 2027, as stipulated in the EU Water Framework Directive. Forestry was identified as a significant pressure on 215 rivers, and simultaneously released sediment was recognised as a master stressor on waterbodies. Previous studies in Ireland have demonstrated that the concentration of total suspended solids (TSS) increase following forestry operations and that elevated sediment levels can have a deleterious effect on macroinvertebrate communities. Forestry operations also influence river hydromorphology; however, this has not yet been researched in Ireland. This research is being completed at seven forestry sites adjacent to streams in upland areas. Hydromorphological assessments will be completed to compare the hydromorphology of core and reference sites. The fine deposited sediment levels will be quantified along river reaches to determine the impacts of sediment levels on the diversity of macroinvertebrate species. Additionally, sediment source fingerprinting will be conducted to determine the relative contribution of sediment from forestry. The research is still in the preliminary stages, but the findings should provide insight into the overall impacts of forestry on the ecological status of these streams and the achievement of the goals in the EU WFD, and help inform mitigation measures.



**Dimitrios Kakavas – DCU****The Impact of Surface to Volume Ratio on the Toxicity of Nanoinks in Daphnids**

Dimitrios Kakavas<sup>1</sup>, Konstantinos Panagiotidis, Keith Rochfort, Konstantinos Grintzalis

(<sup>1</sup> Dublin City University)

The OECD guidelines are currently the only standardized method for evaluating the toxicity of nanoparticles in several aquatic species. However, given the diverse experimental settings used in various ecotoxicology studies, comparison of findings between studies can be challenging. The surface to volume ratio of exposure vessels is an unexplored factor that can affect induced toxicity from nanoparticles. In this study, daphniids were exposed to silver nanoparticle ink in Falcon tubes and Petri dishes representing a deeper and shallow vessel, respectively. Toxicity curves had significant differences between the two exposure vessels, while key enzymes related to energy metabolism and a novel feeding rate assay were used as physiology endpoints. Results indicate vessel shallowness and depth can induce changes in the biological effects of nanoparticle exposure in daphniids from a mechanistic perspective. Enzyme activity also differentiated between the exposed conditions, indicating that the toxicity mechanisms may differ. Overall, this study confirms that the surface to volume ratio of exposure vessels affects nanoparticle toxicity to daphniids, and further research is needed to fully understand its importance in the design of nano-ecotoxicological studies.

## **Bridget Fox - UCD**

### **Assessment and impact of deposited sediment in rivers in Irish agricultural catchments**

Bridget Fox<sup>1,2</sup>, Daire Ó hUallacháin<sup>2</sup>, P.E. Mellander<sup>2</sup> and Mary Kelly-Quinn<sup>1</sup>

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Freshwater ecosystems represent hotspots for global biodiversity, containing almost 10% of all described species. However, these habitats are experiencing even more rapid rates of biodiversity loss than marine or terrestrial ecosystems, in what has been described as ‘an invisible tragedy’. Sediment is a natural component of freshwater, vital to its normal functioning. However, anthropogenic activities have increased its input and storage, turning it from a necessary part of river ecosystems to a ‘master stressor’. Agricultural activities have been recognised as one of the main drivers of excessive deposited fine sediment in rivers in Ireland and worldwide.

Numerous techniques can be used to assess the different attributes of deposited sediment. These different techniques, along with a lack of agreement on standard methods, make intra-research comparisons difficult. In addition, there are no clear guidelines on what level of deposited fine sediment will negatively impact aquatic life and little guidance on what impact changing climate scenarios will have on deposited sediment dynamics.

This study aims to:

- Investigate and experimentally assess the various assessment methods for deposited fine sediment, and refine methods to produce a stakeholder-specific, biologically relevant, rapid assessment method that would be suitable for use in Ireland.
- Establish an ecologically relevant threshold for deposited fine sediment in Irish agricultural catchments.
- Assess river flow dynamics for sediment deposition in present and future climate scenarios.

## **Ciara McGLade -Rivers Trust**

### **Citizen science projects from the Rivers Trust All Ireland**

(Rivers Trust)

The Rivers Trust is the umbrella organisation of the Rivers Trust Movement in Ireland, Northern Ireland and Great Britain, which works to protect rivers. The movement has rapidly grown across the island of Ireland in recent years and now consists of 21 Rivers Trusts and Rivers Associations. We, as the umbrella organisation, support our trusts, who are grassroots organisations operating independently in their catchments. Rivers trusts work closely with local people and as a movement we have successfully engaged with over 15,000 volunteers in citizen science and outreach programmes in Ireland, Northern Ireland and Great Britain. The Rivers Trust provides resources and training through EU projects, such as the cross-border EU Interreg [Source to Tap project](#). Our trusts also coordinate local projects. For example, the Maigne Rivers Trust coordinated a WaterBlitz across the Deel catchment in 2022 as part of the Catchment Excellence Programme, in partnership with the Lean & Green Skillnet and The Rivers Trust. In total, 22 volunteers participated, and identified key issues with phosphate concentration, providing a baseline for future water quality assessments. In the future The Rivers Trust movement aims to be a powerful promoter of citizen science across the island of Ireland, working to restore wild, healthy, natural rivers, valued by all.

**Mary Kelly Quinn - UCD****HydroGen - Environmental DNA in the service of the Water Framework Directive**

Carlsson, J.<sup>1</sup>, Doyle, E.<sup>1</sup>, Kelly, M.<sup>2</sup>, Fossø, F.<sup>3</sup>, Kelly-Quinn, M.<sup>1</sup>

(<sup>1</sup>School of Biology & Environmental Science, UCD.<sup>2</sup>Bowburn Consultancy.<sup>3</sup>Norwegian Institute for Nature Research)

The project will assess how environmental and other DNA based methods can be used to supplement existing methods used in the Water Framework Directive and biodiversity assessments by testing their efficacy across multiple taxonomic groups (macroinvertebrates, fish, phytobenthos and macrophytes). We will also develop and trial DNA-based metrics that can complement the current methods used in the WFD (including cost-benefit analyses). In addition, we will demonstrate the added value of DNA-based methods including generation of biodiversity data for eukaryotes and microbes that can also be used to assess ecosystem function and to detect anthropogenic contaminants in water. To enable upskilling and improve future DNA-based work we aim to backfill existing sequence databases with barcode sequences from Irish aquatic organisms and showcase the most recent and developing technological advances that can be used for DNA-based assessment of the ecological status of running waters.

## **Hugh Feeley -IFSA**

### **British and Irish stoneflies (Plecoptera) – a new key to adults and larvae.**

Hugh will introduce the recently published key for British and Irish stoneflies. This is a key to the adults and larvae with notes on their distribution, life histories and ecology. Plecoptera (Stoneflies) are an extremely important component of British and Irish freshwaters and are most common in clean headwater streams and on stony and rocky shorelines of lakes. This book provides keys to both the adult and larvae of the 35 species found in Britain and Ireland.

Our freshwater ecosystems are under more pressure than ever from a bewildering array of threats. Keys such as this are a vital tool to support the collection and analysis of robust data and evidence required to enable better and faster conservation action for freshwaters. But this is so much more than a key. It's a comprehensive source of existing and new knowledge for anyone with an interest in freshwater ecology and entomology.