Royal Entomological Society
Special Interest Group
Aquatic Insects

Aquatic Insects SIG Confirmed Talks
(full programme to be confirmed shortly)

OPENING KEYNOTE

Michael Samways *PhD, London University*

Talk title: Dragonflies as sentinels in freshwater conservation (complementarity with other taxa, especially EPT)

Michael Samways is Emeritus Distinguished Professor at Stellenbosch University, South Africa.

He focuses on many aspects of insect conservation from philosophy through to strategy implementation, nationally and internationally.

Michael is recipient of the John Herschel Medal of the Royal Society of South Africa, Senior Captain Scott and Gold Medals of the South African Academy of Science and Arts, and Gold Medal of the Academy of Science of South Africa. He received the life-time Stellenbosch University Chancellor's Award, IUCN/SSC Chair's Citation of Excellence, and the Marsh Award from the Royal Entomological Society for outstanding and exemplary lifetime contribution in Insect Conservation. His latest book is Conservation of Dragonflies: Sentinels for Freshwater Conservation (CABI/RES, 2024).

TALKS *(order to be confirmed)*

1. **Lauren O'Rourke**

Talk title: The effects of Urbanization on Dragonflies and Damselflies - (Odonata): A Meta-Analysis

Abstract: Aquatic ecosystems are highly vulnerable to anthropogenic changes, but especially urbanization which alters habitat structure, chemical properties, and the surrounding environments.

Odonata (dragonflies and damselflies) are ecologically well-known and display rapid responses to anthropogenic change, but their responses to urbanization are inconsistent and not fully understood.

Here, we aim to answer "what is the impact of urban and residential areas on Odonata species richness and abundance" using a meta-analysis. We further investigated whether Odonata responses varied by climatic region, landscape, or taxonomic sub-order. Papers that had data on Odonata responses to urbanization were retrieved from the databases SCOPUS and Web of Science and used to calculate the effect size of urbanization on Odonata biodiversity. Across 39 papers and 119 observations, we found that dragonfly richness was lower by a mean of 15.22%

in urban areas compared to natural areas, but abundance did not change. Differences in Odonata abundance and richness between urban and natural sites were not apparent in tropical and forest regions, nor among exclusively dragonflies. Meanwhile, temperate and grassland regions had lower Odonata abundance and richness between urban and natural sites, as did exclusively damselflies.

The similarity in responses between temperate and grassland may be because of overlap in the data, prompting further study to gain a clearer picture of what drives Odonata responses to urbanization.

Our study highlights the heterogeneity among Odonata responses to urbanization, and the necessity for further research to better understand their complex responses to urbanization in an increasingly anthropogenically modified world.

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2. **Finlay Ryder**

Title: How Useful are Functional Feeding Groups in the Data Age?

Abstract: Functional feeding groups (FFGs), introduced in the 1970s, provided a framework for classifying macroinvertebrates according to their feeding mode and diet. Since then, the FFG approach has been widely applied, advancing our understanding of macroinvertebrate feeding interactions and their effects on freshwater communities.

However, the framework represents a simplified view of complex feeding interactions and risks misleading conclusions about freshwater ecosystems and their response to anthropogenic disturbances.

Harnessing the wealth of global data available, we use phylogenetic analyses of macroinvertebrate feeding behaviours to demonstrate that FFGs are less clear-cut than we may previously have thought. Today we have access to a range of technologies which deepen understanding of macroinvertebrate feeding and its role in freshwater ecosystems, reducing our reliance on previous oversimplifications.

We propose a practical framework that
addresses key limitations of the original model and incorporates emerging technologies, deepening insights into dynamic macroinvertebrates feeding interactions and enabling more accurate monitoring and management of freshwater ecosystems.

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3. **Abigail Kirkaldy**

Title: Systematics of the African *Neoperla* Needham (Insecta, Plecoptera, Perlidae)

Abstract: *Neoperla* Needham is an ecologically significant genus of Plecoptera (stoneflies) relevant to biological monitoring, with almost 400 species recognized from Asia, North America and Africa. For most of the past 70 years, its African representatives have been treated as one widespread and heterogeneous species, *Neoperla spio* Newman *sensu lato*.

In 2023, integrative systematics recognized 82 valid species from Africa. Consequently, practically nothing is certain about the ecology of each African species. Additionally, the aquatic nymphal stage, which is the usual focus of biological monitoring, has not been described for any of these species. We are describing nine more novel species from adults caught in Central and Southern Africa. Five more putative species were detected amongst nymphs based on molecular evidence, but will not be formally described due to the lack of associated adult material. Additionally, we review the taxonomy of the nymphs and provide descriptions of this life-stage for six species. An interim key to the South African *Neoperla* nymphs has been constructed to facilitate further research on the ecological meaning of *Neoperla*.

Keywords: Stoneflies, Africa, Cryptic Species, Barcoding, Identifying nymphs

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4. **Violet Onsongo**

Title: Evolution and biogeography of the widespread dragonfly genus *Orthetrum* (Odonata: Anisoptera: Libellulidae)

Abstract: With 67 species, *Orthetrum* Newman, 1833 is the most speciose genus within the family Libellulidae Leach, 1815 (Odonata: Anisoptera), distributed across the Afrotropical, Palearctic, Indo-Malayan, Malagasy, Oceania, Wallacea, and Australasian regions. Despite its wide distribution, serving as a top predator in freshwater ecosystems, the evolutionary history of *Orthetrum* has remained unresolved, with prior studies limited to morphology and sparse genetic sampling (<32% of species). We present here the most comprehensive phylogenetic study of *Orthetrum* to date, sampling 49 of 67 species (~74%) using Anchored Hybrid Enrichment (AHE). Our analyses, integrating concatenated maximum likelihood and coalescent-based approaches, provide a robust, strongly supported phylogeny that confirms the monophyly of *Orthetrum* and reveals four distinct clades. Two clades comprise mostly Afrotropical species whereas the remaining clades are from the Palearctic, Indo-Malayan, Oceania, Wallacea and Australasian regions. Our data indicates that *Orthetrum* split from its close relatives ~40 million years ago, with diversification beginning ~35 million years ago. Ancestral range reconstruction supports an origin in the Indo-Malayan region with dispersal events to other presently occupied regions, including substantial speciation in the Afrotropical region, and more recent colonization of Madagascar from around 13 million years ago.

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5. **<u>Katherine O. Montana</u>**

Other authors: Katherine O. Montana

Title: Metabarcoding reveals Yukon aquatic invertebrate communities via salmon guts

Abstract: Metabarcoding fish guts provides an opportunity to study both the diet of the fish itself and also the community of organisms that live in its environment, in particular aquatic insects. We collected samples of gut contents from both Chinook (*Oncorhynus kisutch*) and coho (*O. tshawytscha*) salmon from the Yukon Territory, Canada. We used an eDNA protocol to extract DNA from the gut contents preserved in ethanol, and we sequenced the gene COI as a metabarcoding locus. We present our preliminary findings of insect diversity in each salmon

species' guts. We also share our findings of best practices for extracting and sequencing DNA for species identification from gut contents.

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6. **Anna Eichert**

Title: Using genomics and population genetics to identify stonefly species of conservation need

Abstract: Stoneflies provide pivotal ecosystem services in both aquatic and terrestrial ecosystems: they are food sources for predators, indicators of water quality, and mediate nutrient cycling and energy flow. As bioindicators, each stonefly species has adapted to particular climate regimes and thus can have different requirements to subsist in their habitat. Like many insects, stonefly populations have experienced a significant loss of biodiversity. Understanding the impacts that specific climatic and anthropogenic variables have on the distribution and ability of stoneflies to survive is necessary to protect vulnerable stonefly populations in the age of an insect apocalypse and sixth extinction. Here, I discuss the conservation need for three Nemouridae stoneflies that live in high latitudinal environments using constructed *COI* haplotype networks and species distribution models. In addition, genomics can infer the historical population demographics of species of great conservation concern, such as the giant salmonfly *Pteronarcys californica*. At 2.40 gigabases, the *P. californica* assembly is the largest of available stonefly assemblies, of which there are only 14. For ongoing monitoring efforts, it is of utmost importance to implement and integrate molecular methods into traditional bioassessment to identify populations at risk of extirpation.

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7. **Manpreet Kohli, *Assistant Professor, Baruch college, City University of New York***

Title: Evolutionary stories of Arctic dragonflies

Abstract: Dragonflies are typically associated with warm, temperate environments, yet several species persist in Arctic freshwater systems where growing seasons are short and temperatures are highly variable. In this talk, I focus on Arctic dragonflies as systems for understanding how insects evolve and persist under extreme cold. Using comparative genomic and transcriptomic

approaches, I examine population structure, demographic history, and genomic signatures associated with cold tolerance across high-latitude dragonfly species. By integrating genomic data with physiological and geographic context, my work highlights both shared and lineage-specific responses to cold environments. My results provide novel insight into physiology and genetic underpinnings of cold tolerance strategies of dragonflies that shape aquatic insect persistence in the Arctic.

8. **Melissa Norton, *Analysis and Reporting Officer, Environment Agency***

Title: Using acoustics to detect aquatic insects in ponds of England

Abstract: Melissa holds an MRes in Wildlife Conservation and works as a Freshwater Ecologist at the Environment Agency. During her academic studies, she specialised in bioacoustics—the study of sound-based communication in organisms.

Her work involves extensive field recording of freshwater environments and freshwater invertebrate species, investigating the acoustic signatures they produce.

In this talk, Melissa will introduce freshwater bioacoustic recording techniques, with a particular focus on insect species within the Corixidae family. She will also outline the equipment required, enabling participants to begin recording and contributing to this area of research themselves.

9. **Dr. Christopher D. Beatty**

Title: Echoes from the Mesozoic: Biogeography and population genomics of the Petaltail Dragonflies (Odonata: Petaluridae)

Abstract: Petaluridae (known as 'petaltails' due to the broad, flat claspers of males which resemble flower petals) is the smallest extant family of dragonflies, with 11 recognized species. While few in number, these species are broadly distributed, with 5 species in Australia, 2 in New Zealand, 1 in Chile and Argentina, 2 in North America and 1 in Japan. Through molecular phylogenetics and biogeographical analysis, I and my colleagues have found that this group first diversified along the southern and western coasts of the supercontinent Pangaea, and have arrived at their current locations through continental drift. Many of the species in this family have persisted since the Cretaceous Era.

Beyond their great age, the petaltails are notable for their life history. Petaltail nymphs live in bog and fens, rather than ponds or streams, and take multiple years to go from egg to adult. This reliance on specialized habitats, as well as their protracted development times, make these species susceptible to environmental perturbations. Through a combination of population and functional genomics, morphological and behavioral studies, we are looking into how these dragonflies are adapted to survive in their unique environments.

10. **Dr Ian M Strachan, *Consultant Ecologist***

Title: Using aquatic insects to monitor habitat restoration on Corrour Estate, in the Scottish Highlands.

Abstract: Corrour is a large upland land-holding of 23,000 ha in the south-west Highlands. A key aim of management is the restoration of habitats. For ten years we have been monitoring aquatic invertebrate populations, at species level, using kick sampling across a network of riverine sites. This forms part of an extensive monitoring programme by Corrour.

The initial focus of the aquatic monitoring was a large area of forest on deep peat which is being restored to blanket bog by removal of alien conifers. More recently, the work has extended onto open hill ground where management includes reduction of deer numbers, restoration of eroded blanket bog and expansion of native woodland, including along riparian zones.

Over 10 years at Corrour we have obtained data for 330 samples from 47 sites, at altitudes between 250 and 500m. We have found a rich fauna of aquatic insects, notably with 23 species of stoneflies (Plecoptera) - 70% of the British fauna. Invertebrate assemblages varied between sites but there are indications of a general upward trajectory over the years. Researchers from the University of St Andrews, in partnership with Corrour, are investigating how eDNA sampling can complement this work, to monitor the effectiveness of landscape-scale habitat restoration in the Highlands.

11. Hannah Thomas *(Chester Zoo)* and Sarah Hawkes *(Buglife's Project Officer)*

Title: Scarce Yellow Sally Project

Abstract: The Scarce Yellow Sally stonefly was thought to be extinct in Britain until a small population was found on the River Dee in Wales in 2017. We are keen to understand whether the Scarce Yellow Sally is found in other rivers, especially in and around Wales where it is currently recorded. Due to its mostly hidden lifecycle, recording stoneflies can be difficult. They spend much of their early life underwater, undergoing moults as a larva. However, as adults they leave the water and tend to frequent sunny surfaces and vegetation. This talk covers the current conservation and monitoring taking place for this species.

Other speakers TBC...

CLOSING KEYNOTE:

Dr Jessica Ware, *Curator and Division Chair of Invertebrate Zoology at the American Museum of Natural History*

Talk title: North American Aquatic Insect team: an overview of the global work at the American Museum of Natural History and associated organisations

Abstract: Dr. Jessica L. Ware is leads groundbreaking research in insect systematics and evolution at the American Museum of Natural History.

Her work integrates molecular phylogenetics, genomics, and morphological analyses to illuminate the evolutionary relationships and biogeography of diverse insect lineages, with particular emphasis on Odonata (dragonflies and damselflies) and Dictyoptera (cockroaches, termites, and mantises). Through comprehensive phylogenetic frameworks, Dr. Ware's research reveals patterns of species diversification and distribution across global ecosystems, advancing our understanding of insect biodiversity and evolutionary history.

Beyond her scientific contributions, Dr. Ware is a transformative leader in promoting equity and inclusion within STEM. As Past President of the Etnomological Society of America, Past President of the Worldwide Dragonfly Association and Past President of the Society of Systematic Biologists, she has championed initiatives to diversify entomology. Her co-founding of Entomologists of Color (EntoPOC) addresses systemic barriers facing Black, queer, and underrepresented scientists in the field. Dr. Ware holds a PhD from Rutgers University and a BSc from the University of British Columbia. Her achievements have earned recognition including the Presidential Early Career Award for Science and Engineering (PECASE), reflecting her dual impact as both a leading evolutionary biologist and advocate for scientific equity.

Dr. Jessica L. Ware is the Curator and Division Chair of Invertebrate Zoology at the American Museum of Natural History (AMNH), a prominent evolutionary biologist and entomologist known for her work on insect evolution, particularly dragonflies, cockroaches, and termites, using genetics and morphology to understand their phylogeny, behaviour, and biogeography, while also being a passionate advocate for diversity and inclusion in STEM.
Jessica Ware: Division Chair of Invertebrate Zoology | AMNH