Aquatic Insects Special Interest Group
Climate Change Impacts on Aquatic Insects

Centre for Ecology and Hydrology, Library Ave, Lancaster, Bailrigg, Lancashire LA1 4AP

Tuesday 1st October, 2019

Convenors: Craig Macadam (Buglife) and Jenni Stockan (James Hutton Institute)

10.00	Registration and coffee
10.30	Welcome and introduction
10.40	**Steve Ormerod (University of Cardiff)** Climate impacts on aquatic insects
11.10	**Rachel Stubbington (University of Nottingham)** Diversity in the face of adversity: the aquatic–terrestrial insect communities of 'temporary' streams
11.40	**Kieran Khamis (University of Birmingham)** Extreme drought pushes stream invertebrate communities over functional thresholds
12:00	**Lyndall Pereira da Conceicoa (National Museums Scotland)** Freshwater biodiversity and biomonitoring in Africa
12:20	**Craig Macadam (Buglife)** Developing a Climate Change Vulnerability Index for UK freshwater invertebrates
12:40	Lunch
13:30	**Arron Watson (Environment Agency)** DATA: A Collaborative Approach to Act on Climate Change
13:50	**Workshop sessions**
15.00	Tea and close

ABSTRACTS

Diversity in the face of adversity: the aquatic–terrestrial insect communities of 'temporary' streams

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Temporary streams sometimes stop flowing, and many dry. These natural aquatic–terrestrial ecosystems can dominate dryland stream networks and are also common in cooler, wetter regions. Globally, temporary streams are increasing in extent in response to anthropogenic drivers including climate change. The insect communities in temporary streams include lotic, lentic and terrestrial taxa that timeshare the channel as it shifts between flowing, pool and dry phases. Although local-scale richness of aquatic insect communities can be lower than in perennial streams, sharing an ever-changing habitat mosaic enhances community variability among sites and times. Many aquatic insects are resilient to drying, and quickly recolonize from refuges when flow returns. Others are resistant, with desiccation-tolerant forms surviving in the invertebrate 'seedbank'. In addition, temporary stream specialists include the scarce purple dun, *Paraleptophlebia werneri* (Ephemeroptera, Leptophlebiidae), which inhabits the 'winterbourne' chalk streams of south England. Collectively, these taxa contribute to high regional-scale biodiversity, and insect diversity is further enhanced by the terrestrial species that colonize during dry phases. As water-resource and land-use stressors interact within our changing climate to alter flow permanence regimes, innovative approaches are needed to underpin effective temporary stream monitoring and management.

Stream community responses to drought intensification: evidence from a large scale mesocosm experiment

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Droughts are predicted to intensify in the future, potentially causing many running waters to exceed key ecological thresholds. The effects of these events have not been assessed directly because the required continuous drought disturbance gradient is rarely encountered in natural streams. To address this research gap we established a highly resolved, drought intensity gradient using large, once through, mesocosm channels enabling macroinvertebrate community responses (taxonomic and trait based) to be quantified. Threshold changes were detected for >60% of the most abundant invertebrate taxa, with sudden population crashes or irruptions in response to increased drought intensity. These step-changes were most pronounced under moderate drought conditions (~50% wetted area). We also observed significant responses in 75% of our 'drought traits' (i.e. those selected based on *a priori* predictions of filtering by drought). Behavioural traits describing movement (dispersal, locomotion) and diet were sensitive to moderate intensity drought, as channels fragmented into isolated pools. By comparison, morphological and physiological traits showed little response until streams dried. Our study demonstrates that small changes in drought intensity can trigger abrupt functional shifts in stream communities, suggesting that traits-based approaches could be particularly useful for diagnosing catastrophic ecological responses to global change.

Freshwater biodiversity and biomonitoring in Africa

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Africa is a water scarce region. Growing demands for fresh water from rapidly expanding populations puts increasing pressure on the quantity and quality of water available. Rapid biomonitoring assessment techniques to estimate water quality changes are widely used, but there are recurrent issues with accurate identification of macroinvertebrate specimens. These biotic indices are mainly based on family level taxonomy, however finer taxonomic resolution is needed to get a true reflection of diversity from which we can infer ecological integrity. On a global scale, most biodiverse regions lack taxonomic expertise to cope with the unknown biodiversity, yet it is these regions that are most under threat from climate change and poor management. Tools to rapidly assess biodiversity using DNA-methods are being developed, even for regions where species are still undescribed in large numbers, showing that it is possible to assess biodiversity accurately even when the underlying taxonomy is not well established. These tools have the potential to revolutionise how we view biodiversity, amplify the need for further taxonomic knowledge and assist in important water management decisions.

DATA: A Collaborative Approach to Act on Climate Change

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Climate change is a global problem, if we work together we can achieve anything physically possible. One way we can act now is by working collaboratively which has been proven to solve some of the biggest challenges humanity has faced. Data is widely available, working for the Environment Agency has shown me how the data we collect we also widely share, sparking an innovative idea which would need shared interests and expertise from other organisations. The Environment Agency makes 90% of the information It collects available to the public, along with other organisations making information on weather, aquatic invertebrates and climate available. What if we worked together to assess that data in relation to climate change with the common goal of conserving our aquatic invertebrates. A collaborative approach is suggested, including a conceptual working group which could create 'action points' that could aid monitoring and conservation against climate change, locally and nationally. This presentation is finished opening up to the attendees to feedback and suggest how we can act now using widely available data that hasn't been suggested.