Interactive effects of climate change and contaminants: environmental risks and human health implications

Chairs: Elisabeth Maria Gross, Antonio Manuel Barros Marques, Arnaud Elger

Most ecosystems are no longer controlled by earth processes but by human activities. Anthropogenic activities are responsible for effects at the global, regional and local scale: Climate warming as a global event and the local release of numerous pollutants are two of multiple stressors acting at such different spatial scales. Thus, multistressor studies combining the effects of climate change and chemical pollution are of paramount importance to understand possible additive, synergistic or antagonistic interactions from the organism to ecosystem levels, both in aquatic and terrestrial environments. Temperature increase, extreme meteorological events and additional greenhouse gas emissions are only some climate change consequences that can modify contaminant availability and its modes of action in a compound-specific way. The present session proposal would welcome original presentations (posters and platform) tackling effects of pollutants in climate change contexts at relevant levels. This includes studies at the cellular and individual level, such as bioaccumulation and bioavailability, the capacity to metabolize contaminants and physiological, behavioural and toxicological responses, including studies focusing on human health and safety aspects. We also aim for contributions working at the community or ecosystem level, working a different levels of complexity such as trophic interactions or complex food webs, taking into account relevant ecosystem processes. Each accepted contribution will be asked to provide answers to the following questions:

1) Which were the most sensitive endpoints in your study?

2) Did you observe an interaction between the target stressors?

3) Can you suggest measures to minimize potential risks of multistressor scenarios?

Preliminary session type: Platform and Poster

Multiple stresses in aquatic ecosystems: Assessment of stress response and its consequences in organisms

Chairs: Claudia Wiegand, Laure Giamberini , Catherine Mouneyrac

Despite the effort to improve water qualities within the EU-WFD, structure and functioning of too many aquatic ecosystems are not yet in a good ecological status. Anthropogenic impact occurs not only via the introduction of harmful chemicals from various sources and eutrophication, but also by degrading the habitat structure, and facilitating introduction and spreading of invasive species. Hence aquatic organisms face stress being simultaneously or sequentially exposed to a variety of chemicals plus confounding physical factors (temperature, salinity, habitat degradation, etc.), and biological impacts (such as invasive species, food availability, pathogens).

Although multiple stress approaches have received growing interest in the last decade from researchers and stakeholders within the field of environmental sciences and management, knowledge is still lacking particularly concerning methodologies for studying complex systems or realistic environmental conditions. The understanding of the consequences of a variety of simultaneously occurring environmental stressors is essential to develop predictive capabilities and response strategies by scientists and the authorities.

A wide-ranging set of biomarkers, most of which at the subcellular level, enables to assess adverse effects of harmful substances in a variety of organisms. For comprehensive assessments, multi-biomarker batteries are frequently applied. Recently, the addition of indices assessing the consequences for the organism in terms of e.g. energetic resources, growth, reproduction success, or population densities, enable to better predict outcomes for higher organization level addressing the environmental relevance of the stressors.

This session welcomes investigations of the ecological relevant scenario of aquatic (limnic and marine) organisms facing multi-stress by being exposed to a mixture of chemicals in the context of confounding factors. Both laboratorial and field studies are welcome. Emphasis will be on the possible consequences for the organism, and higher organization levels, such as population, for example by modeling approaches (DEB-Tox theory or similar) in order to contribute to a powerful risk assessment.

Preliminary session type: Platform and Poster

Utilising species and community traits in ecotoxicology: towards species grouping and mechanistic prediction

Chairs: Iseult Lynch, J Baas, Martina Vijver

One of the major challenges in ecotoxicology is to extrapolate laboratory data regarding chemically induced adverse effects obtained for a single species or a very limited number of species (studied either in parallel or as a simple food web) to the wide range of species found in the environment. Over the past 10 years, attempts have been made to link species traits, including their adaption value and interplay with other traits within a species, to ecotoxicological endpoints as a route forward. The basic idea is that there are only so many targets in a species but an unending list of chemicals and highly variable circumstances for exposure, even excluding effects of mixtures. On a community level trait-based approaches have been touted as providing a predictive basis for diffuse impacts and acute events for individual species within the context of community ecology. Here, each species has differential degrees of effect and response, including the ability to adapt to chemical exposure and impact other members of the ecosystem via release of allomones.

Approaches based on species traits are characterized as being taxon-independent and facilitate the much needed mechanistic interpretation of toxic effects across environmental gradients. This aligns well with the OECD's adverse outcome pathway (AOP) concept which relates chemical exposure to subsequent (molecular, cellular) physiological and behavioural changes that result in illness or injury to individuals. Some examples of early traits-based success include explaining the differences in sensitivity of species, predicting the sensitivity of species based on the similarities in receptors also found in humans, and using data on the complexity of the genome to make predictions on ecotoxicological endpoints, etc.

This session aims to address a wide range of contaminants in order to find species traits that relate to generalised ecotoxicological / adverse effect end-points. We specifically invite contributors to present work that relates biological traits to ecotoxicological endpoints at different levels of organisation (specific traits / species / community). Individual traits can link to the whole species including size, morphology, feeding behaviour, armour etc. One level deeper, traits can be considered as having the complexity of the genome or in analogy with conserved genes and proteins linked to specific functions and endpoints. On the highest level of organisation, traits that allow extrapolation from individuals to population or communities levels can be considered. The key feature of the session is that the research to be presented needs to focus on finding general principles allowing extrapolation to other species, other compounds, and/or other levels of organisation as a basis for grouping, read-across and prediction of mechanistic effects of chemicals.

Preliminary session type: Platform and Poster

Wildlife ecotoxicology: from food chain exposure to population effects

Chairs: Renaud Scheifler, John Elliott, Kim Fernie

Populations of many terrestrial vertebrates are exposed to plethora of environmental contaminants. Exposure to contaminants already released in the environment such as legacy persistent organic pollutants tends to be low level and chronic in nature. Such exposure is normally direct from diet and related to accumulation of a persistent chemical through a food chain. Wild animals also can be exposed to greater concentrations of compounds that are recently and purposely released in the environment, including plant protection products, insecticides or fungicides, or mammalian pest control products such as rodenticides. Effects of low level, chronic exposure to compounds may be very elusive and difficult to separate from effects of other stressors. Recent advances in molecular biology have, however, improved the ability to detect such subtle perturbations. Generally, exposure does not result in direct mortality, but animals exhibit reduced fitness, which can be compounded by other environmental stress factors such as the often inter-related factors of food supply and weather. In contrast, effects of acute toxicity may be relatively obvious, including mortality, although affected animals may be difficult to find in the field, as they seek shelter to recover. Linking subtle molecular or 'biomarker' effects to individual health can be challenging, linking effects detected at the individual level, even mortality, to impacts at the population level is even more challenging. For both regulatory purposes and risk assessment it is essential to obtain information on risks from both acute and chronic exposure scenarios, and to establish links between measurable biomarkers and implications for populations. In this session we are soliciting presentations that provide insight into effects at both molecular, population and even community levels, and in particular studies that make credible connections. This could include assessments that employ an adverse outcome (AOP) framework.

Sponsored by: Wildlife Toxicology Advisory Group (Global)

Preliminary session type: Platform and Poster