MASTS Annual Science Meeting 2025

Call for Speakers and E-Posters

SPEAKER

For speaker offers, please indicate which session you are interested in:

Multiple Stressors

Empirical determination of the interaction landscape for temperature, CO2 and nitrate for a model diatom

Full name: Simin Gao
E-mail address of lead presenter: simin.gao@ed.ac.uk
Organisation: the University of Edinburgh
Student: N

Abstract

Increasing temperature (T), CO_2 levels and varied nitrate (N) concentrations are three key changes occurring in contemporary oceans that have the potential to affect diatom growth and other traits. The responses to individual drivers are reasonably well established. Increased temperatures and CO_2 levels, for example, generally increase diatom growth. On the other hand, increased stratification of the ocean surface decreases nutrient supply and growth. However, little is known how diatom growth responds to these three drivers acting together and the uncertainty in multiple factors interactions limits the accuracy of projections of future diatom populations. Empirical data is required to address this knowledge gap. Here, a series of two-driver experiments (CO_2xT, N x CO_2 and TxN) were conducted, using six levels of each stressor to characterize the interactions between three stressors on growth and underlying traits of the model diatom *Thalassiosira weissflogii*. Here, we will focus first on how the combined effects of temperature and CO_2 affect diatom population growth, cellular composition, and stress indicators and discuss how conserved physiological processes, such as differences in carbon concentrating mechanisms (CCMs) may underline the observed interaction. Second, we will focus on the combined effects of N and CO_2 concentrations and discuss the interaction of these drivers on diatoms in terms of growth, nutrient uptake, and nutrient storage. Overall, these experiments help us capture the shape of a response surface of a key primary producer to changes in global ocean drivers, over a broad range of environmental conditions.

The abstract deadline for both talks and e-posters is **1700 on 29th August 2025**. For your abstract to be published in the conference programme, you must register and pay to attend the conference **in person**. Further information about your registration will be provided in the acceptance email. Presenters will be informed about their submission by 24 September.

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Optional - Additional Information

Include any hyperlinked pages and documents you wish to reference. Please keep this brief.

Optional - Acknowledgements

Write down any necessary acknowledgements here, for example funding bodies. Please keep this brief.

Optional - Additional Authors

Mridul Thomas[2], Bjorn Rost[3], Ben Ward[4] and Sinéad Collins[1]

1 Institute of Ecology and Evolution, University of Edinburgh simin.gao@ed.ac.uk

2 Alfred-Wegener-Institut Helmholtz-Zentrum fu¨r Polar- und Meeresforschung, Am Handelshafen, Bremerhaven, Germany

3 Department of Aquatic Ecology, Eawag: Swiss Federal Institute of Aquatic Science and Technology, Dubendorf, Switzerland

4 Ocean and Earth Sciences, University of Southampton, National Oceanography Centre Southampton, Southampton, SO14 3ZH, UK

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Call for Speakers and E-Posters

Template for Abstract Submission

SPEAKER

For speaker offers, please indicate which session you are interested in:

Multiple Stressors

Title of abstract

Behavioural responses of common frog tadpoles to ecologically relevant contaminant mixtures

Full name: Jude Banks Wilson
E-mail address of lead presenter: jbw2000@hw.ac.uk
Organisation: Heriot-watt University
Student: Yes

Abstract

Tadpole behaviour may be a sensitive bioindicator of aquatic contamination, yet responses to environmentally relevant exposures remain poorly understood. We investigated the effects of contaminant mixtures - based on UK pond water (0.0065–65 µg/L) - on common frog (*Rana temporaria*) tadpoles. All contaminant mixture treatments also contained a fixed base metals mixture (144 µg/L). We also exposed tadpoles to a behavioural positive control (fluoxetine, 10 µg/L). Exposures ran from embryonic to hindlimb growth stages (Gosner 26–31, 27 days; five replicates *per* treatment; six tadpoles *per* tank). Locomotor activity and inter-individual spacing were quantified in group open-field tests (three *per* trial), followed by a startle response assay. Data were analysed with Generalised Linear Mixed Models, with Gosner stage as a covariate. In open-field tests, tadpoles at the highest mixture concentration (65 µg/L) showed reduced spacing ($p = 0.045$), and there was a tendency for slower swim speed in response to fluoxetine ($p = 0.067$). In startle response tests, swim speed was significantly lower in response to fluoxetine (20 mm/s; $p = 0.044$) and the 6.5 µg/L treatment (median = 21 mm/s; $p = 0.037$), but not the 65 µg/L treatment (25 mm/s; $p = 0.41$); compared with controls (29 mm/s). Treatments did not affect development or survival. Findings suggest contaminant mixtures can alter 'schooling' behaviour and startle responses in common frog tadpoles, potentially reducing fitness (e.g., for predator avoidance). Tadpole behaviour thus offers a promising non-destructive indicator of pond health, though further work is needed before confident application.

Authors: Teresa F Fernandes[1], Charles R. Tyler[2], and Frances Orton[1]

Affiliations:

[1] *Heriot-Watt University, School of Energy, Geoscience, Infrastructure and Society, Institute of Life and Earth Sciences*

[2] *University of Exeter, Faculty of Health and Life Sciences, Department of Bioscience*

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SPEAKER
Multiple Stressors

Chemical Mixtures, Herbicides, and Frog Population Resilience in UK Ponds: Linking Field Chemistry to Recruitment, Survival, and Body Condition

Full name: Dominique M J Anderson
E-mail address of lead presenter: d.m.j.anderson@hw.ac.uk
Organisation: Heriot Watt University
Student: N

Abstract

Small freshwater bodies are biodiversity hotspots but vulnerable to multiple stressors, including chemical pollution, due to limited volume and proximity to agriculture and urban land uses. We investigated how chemical mixtures, and other environmental stressors influence population resilience in the European common frog (*Rana temporaria*) across 47 UK ponds sampled in March and May 2024. Resilience was estimated using two complementary metrics: one capturing recruitment success based on eDNA, frogspawn, and tadpole presence, and a second reflecting persistence and development from tadpole surveys. Additionally, tadpole body condition was modelled using the scaled mass index (SMI). Chemical and environmental data (150 organic compounds, 28 metals, water quality, nutrients, heatwave frequency, and predator presence) were analysed using cumulative stressor indices, individual-analyte LASSO regression, and PCA-based mixture modelling. Herbicides consistently predicted reduced recruitment and tadpole survival, emerging as the strongest negative drivers across both resilience metrics. PCA revealed that gradients dominated by pharmaceuticals and low herbicide loads aligned with better recruitment outcomes, whereas those driven by herbicides and systemic fungicide carbendazim aligned with poorer outcomes. Heatwave frequency and wastewater-associated compounds (e.g., cotinine, nicotine) were also linked to lower recruitment, while some pharmaceuticals (e.g., pirenzepine, diclofenac) were positively associated with recruitment success. Conversely, SMI showed a significant positive effect of fungicides, while herbicides sustained a marginally negative effect on body condition. These findings suggest that recruitment, survival, and body condition are influenced by specific chemical classes. Ongoing molecular work will investigate whether herbicides act via toxicity directly or indirectly via altered food availability.

Additional Authors
Jude Wilson (HWU), Lavanya Vythalingam (HWU), Gloria Dos Santos Pereira (UKCEH), David Spurgeon (UKCEH)m and Frances Orton (HWU)

MASTS Annual Science Meeting 2025

Call for Speakers and E-Posters

Abstract Submission

SPEAKER – Multiple Stressors

Phenotypic and gene expression changes of beadlet anemones (Actinia equina) under multi-stressor salinity and diesel stress

Full name: Hamish Williams
E-mail address of lead presenter: h.williams.22@abdn.ac.uk
Organisation: University of Aberdeen
Student: Y

Abstract

Anthropogenic stressors are becoming increasingly prevalent, combined with climate change driven stressors, organisms are facing increasing pressure from multiple stressors simultaneously. Understanding how these stressors affect organisms' and their ability to plastically respond in laboratory settings is crucial for developing models and management strategies. We can understand responses to stressors by investigating phenotypic plasticity, underpinned by both phenotypic and behavioural changes. By observing the changes in gene expression through whole genome RNA-sequencing, we can understand the key physiological processes and functions utilised to mitigate stress. Behavioural changes such as increased rates of migration away from stress, or altered feeding rates may contribute to stress mitigation. Combining these observations together provides an opportunity to understand key transcriptional activity which links to behavioural changes alongside physiological responses, enhancing our understanding of phenotypic plasticity to stressors. We conducted a multi-stressor experiment on the beadlet anemone *Actinia equina*, assessing both the behavioural (feeding and startle responses) and differential transcriptional responses to the independent and combined effects of diesel and salinity stress of increasing intensities. Analysis of startle response latency showed a significant increase in the time taken to re-open after startled with diesel stress, with no significant change with salinity stress or combined stress. No feeding responses were observed throughout the experiment. With differential gene expression analysis, we will perform an genome wide investigation into stress pathways of biological processes and molecular functions, and linking these gene ontologies from enrichment analysis back to behaviour.

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Acknowledgements
NERC, SUPER DTP

Additional Authors
Dr David Fisher, Dr Marius Wenzel, Fabiana Franco

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Call for Speakers and E-Posters

Template for Abstract Submission

SPEAKER

For speaker offers, please indicate which session you are interested in:

Multiple Stressors

Commonly Co-Occurring Stressors in Industrialised Estuaries Disrupt Embryonic Development in Blue Mussels

Full name: Isabella Jackson
E-mail address of lead presenter: imj2000@hw.ac.uk
Organisation: Heriot-Watt University
Student: Y

Abstract

Pollutant mixtures are present in industrialised estuaries and may interact with climate change to negatively impact estuarine species. We investigated whether the recent declines in Scottish blue mussel (*Mytilus edulis*) populations could be explained by the presence of multiple stressors using a laboratory-based experimental design, by examining their effects on embryonic development. *M. edulis* embryos were exposed in a 48-hour bivalve toxicity test to three stressors: an environmentally relevant pollution mixture (0.015–15 µg/L organic compound mix + 20–20,000 µg/L metal mix), elevated temperature (18 °C), and reduced salinity (25 ppt), compared against the controls (0 µg/L; 15 °C; 35 ppt). Contrary to expectation, optimal development occurred at the elevated temperature (18 °C) when combined with fully saline conditions (35 ppt), compared to at the lower temperature (15 °C). Pollutant mixtures caused a dose-dependent reduction in normal D-shaped larvae development, with effects amplified under low-salinity, low-temperature conditions. Multivariate analysis confirmed significant interactions occurred between co-exposure to the pollutant mixture and temperature or salinity, but not between temperature and salinity nor amongst all three stressors. When exposed to the environmentally relevant pollution treatment (1.5 µg/L organic mix + 2000 µg/L metal mix), normal development was 40% at 35 ppt and 15 °C, increasing to 64% at 35 ppt and 18 °C. At 25 ppt, normal development dropped to 19% and 9% at 18 and 15 °C, respectively. These findings demonstrate interactions of pollution, temperature and salinity at realistic intensities on a sentinel estuarine species which has experienced recent, severe declines.

Acknowledgements
This study is funded by the Scottish Universities Partnership for Environmental Research Doctoral Training Partnership (SUPER DTP).

Additional Authors
Mark G.J Hartl[1], Frances Orton[1], Clayton R. Magill[2] and Mark A. Taggart[3].
[1] Institute of Life and Eart Sciences, Heriot-Watt University, Edinburgh, UK.
[2] Lyell Centre, Heriot-Watt University, Edinburgh, UK.
[3] Environmental Research Institute, University of the Highlands and Islands, Thurso, UK.

MASTS Annual Science Meeting 2025

Template for Abstract Submission

SPEAKER

For speaker offers, please indicate which session you are interested in:

General Science Session / Multiple Stressors

The effects of marine noise on *Mytilus edulis* response to *Vibrio splendidus*

Full name: Tim Regan
E-mail address of lead presenter: tim.regan@roslin.ed.ac.uk
Organisation: The Roslin Institute, University of Edinburgh
Student: N

Abstract

Blue mussels (*Mytilus* spp.) are a globally significant aquaculture species, cultivated across all continents except Antarctica. Both farmed and wild populations provide essential ecosystem services, including water filtration, nutrient cycling, and biogenic reef formation that enhances biodiversity and mitigates coastal erosion. However, mussels are increasingly threatened by stressors intensified by climate change, such as rising storm frequency, marine heatwaves, ocean acidification, irregular phytoplankton fluctuations, and emergent diseases. These challenges weaken mussel resilience and have been linked to mass mortality events in European populations over the past decade. Additionally, anthropogenic noise, known to harm various marine species and habitats, remains understudied in its effects on mussels. In this study, we investigated the influence of marine noise on infection outcome in *Mytilus edulis*. Mussels were exposed to simulated underwater ship noise for one week, followed by a bacterial challenge with GFP-expressing *Vibrio splendidus*. Although no significant transcriptomic response was observed to the noise alone, noise-exposed mussels exhibited higher levels of GFP+ *V. splendidus* and a suppressed transcriptional response to infection compared to controls. These findings suggest that noise exposure compromises the immune competence of mussels, impairing their ability to resist bacterial infection. This research highlights the potential impact of environmental stressors like noise on mussel health and resilience. Understanding such interactions could inform aquaculture management strategies, such as stress mitigation or site selection. However, further studies are required to explore the duration of noise-induced effects and whether mussels can develop tolerance to prolonged noise exposure.

Acknowledgements

The authors acknowledge funding from the BBSRC. Additionally, we acknowledge Prof. Eric Stabb (University of Illinois, Chicago) for providing Vibrio vectors and helper strain. Finally, thanks to Scottish Shellfish (Bellshill, UK) for donating the animals used in these experiments.

Additional Authors

Ambre Flora Chapuis[1], Matthew Wale[2], Morgan Bailey[1], Hannah M. Farley[1], Tim P. Bean[1]

[1]The Roslin Institute, University of Edinburgh; [2]School of Applied Science, Edinburgh Napier University.

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Call for Speakers and E-Posters

Template for Abstract Submission

SPEAKER/~~E-POSTER~~

For speaker offers, please indicate which session you are interested in:

Multiple Stressors

Title of abstract: Pelagic Predators, Mesopelagic Prey Fields and Conservation Futures

Full name: Jonathan Houghton
E-mail address of lead presenter: j.houghton@qub.ac.uk
Organisation: Queen's University Belfast
Student: N

Abstract

The main text must be size 12 in calibri font. Keep the page margins the same as set here. Paragraphs must be justified (straight edged) on both left and right. Use single line spacing and leave a line gap between paragraphs. If you would like to insert a figure you can do so but be mindful of space.

The word limit is **250 words**, and abstracts should be accessible to other disciplines, by avoiding jargon and keeping technical details simple. The abstract will appear in the programme as submitted; however, the organising committee reserves the right to edit abstracts for clarity or correctness of English and will consult the author if any significant changes are needed.

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ABSTRACT [250 Words]

Pelagic predators such as sharks, turtles and sunfish depend heavily on mesopelagic prey fields that are increasingly exposed to multiple stressors. Two of the most significant are climate-driven shifts in oceanography, which alter the structure and resilience of prey assemblages, and the emerging exploitation of mesopelagic fishes as a commercial resource. Together, these pressures raise fundamental questions about how predator–prey coupling in offshore ecosystems will be reshaped, and what evidence is required to guide conservation and management.

Starting in late 2025, MOSAIC (Multi-disciplinary Ocean Sensing for Adaptive International Conservation) is a UK–EU project building a multi-sensor observation system to inform data-driven conservation of endangered species in a changing ocean. Within this ambition lie policy-facing action plans on elasmobranchs, sea turtles and pelagic climate resilience. We outline the integration of biologging and telemetry, geospatial and physiological modelling, stable isotope analysis and a range of molecular techniques. By explicitly pairing predator movement data with concurrent prey-field characterisation, the programme will test how hydrographic forcing and prey availability interact to shape predator foraging strategies, connectivity and ecosystem resilience.

Looking ahead, MOSAIC will generate climate indicators and three-dimensional risk assessments that incorporate both climate variability and potential fishery expansion. In doing so, the programme moves beyond single-stressor approaches to deliver a framework for anticipating how multiple pressures combine to affect offshore ecosystems. This talk will outline the rationale, design and future directions of MOSAIC, situating the project as a timely contribution to understanding and managing multiple stressors in the pelagic realm.

Optional - Additional Information
Project website not available at time of submission
Overall Programme webpage: https://www.seupb.eu/peaceplus/overview

Optional – Acknowledgements
This research was funded by the PEACEPLUS Programme, managed by the Special EU Programmes Body (SEUPB).

Optional - Additional Authors
None as not presenting results, mor a conceptual framework at the start of the project to foster further MASTS collaboration.