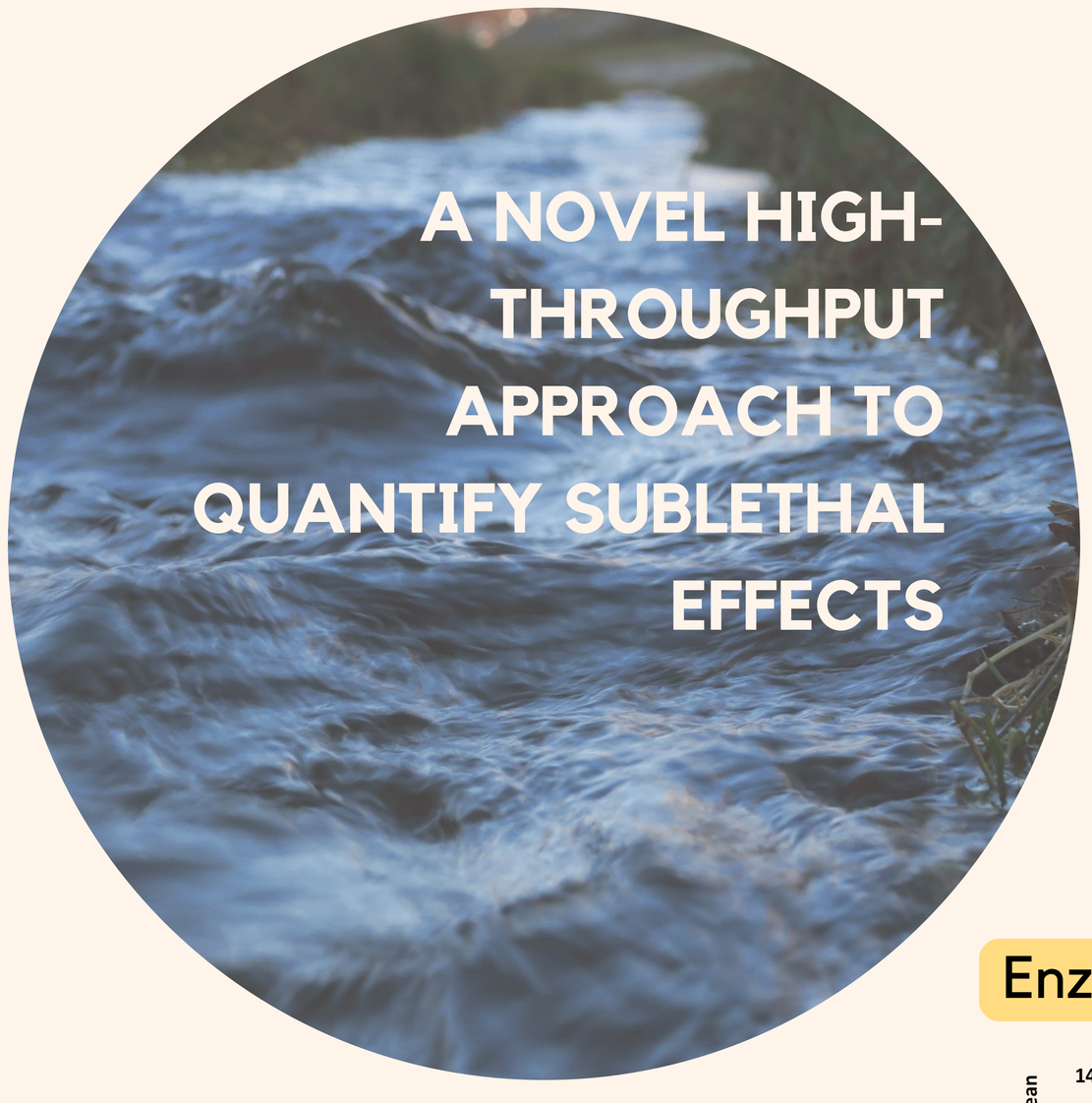
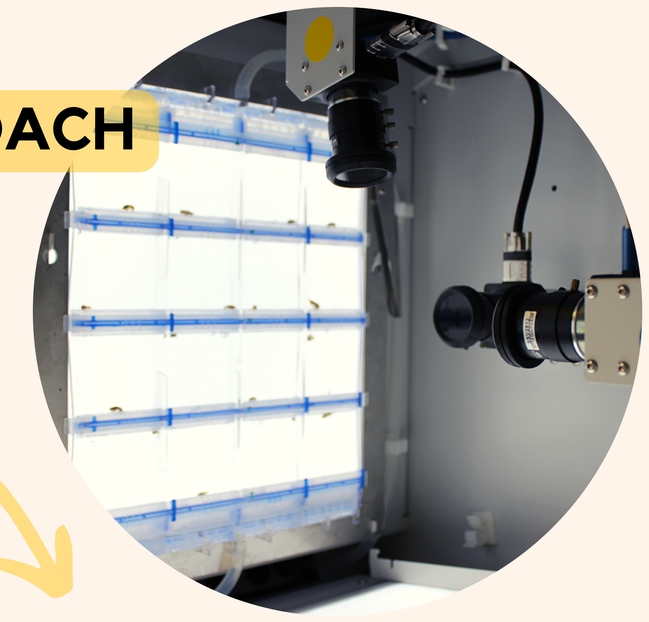


A NOVEL HIGH-THROUGHPUT APPROACH TO QUANTIFY SUBLETHAL EFFECTS

BEHAVIOURAL ECOTOXICOLOGY

LAURA J. SOOSE[1,2*], KIM S. HÜGL[1,2], JÖRG OEHLMANN[1], ANDREAS SCHIWY[2], HENNER HOLLERT[2], JONAS JOURDAN[1]

MULTI-SCALE APPROACH



Background:

- Increasing demand of sublethal endpoints and their standardisation
  - Higher sensitivity than traditional endpoints

Goals:

- Standardised method in the lab for invertebrate behaviour
- Making non-standard studies more reliable and relevant for environmental risk assessment

Study organism: *Gammarus pulex*

- High abundances
- Essential ecosystem services
  - Leaf shredding
  - Provision of resources for other trophic levels

Method:

- Behavioural change analysis with the multi-species online monitoring tool ToxmateLAB
- Pulsed pollutant exposures for 90 min
- Endpoint: Total distance moved [m]
- Body sizing and sex identification as covariates for multivariate statistics
- AChE inhibition assay
  - Differentiation: mode of action vs. stress reaction

10% of LC_{50}

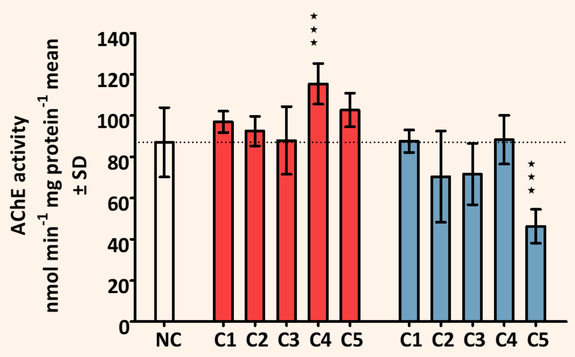
[µg/L]	C1	C2	C3	C4	C5	
Dichlorvos	0,15	0,49	1,56	5	16	NC
Methiocarb	0,18	0,58	1,88	6	19,2	NC +SC

Outlook:

Project to continue the investigation of behavioural endpoints in the context of the multi-stressor framework focusing on

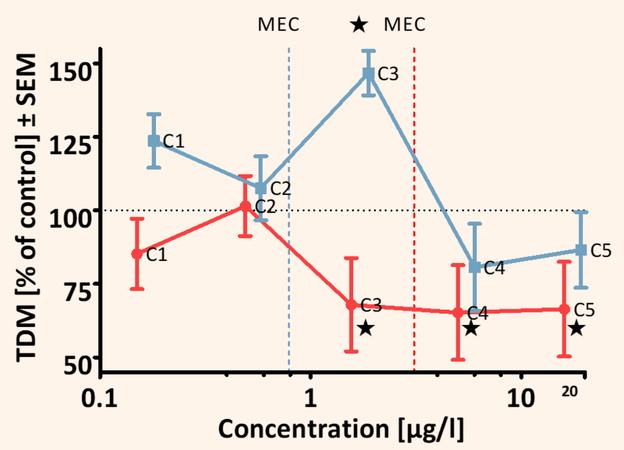
- Anthropogenic chemical pollution
- Climate change
- Biodiversity
  - Native vs. invasive *Gammarus species*
  - Parasite effects

Enzyme

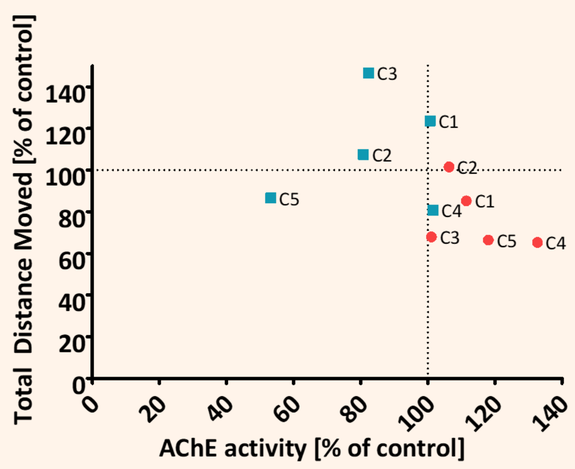


Results of AChE inhibition assay: The bars show the mean AChE activity of the merged controls in comparison to the different treatments with Dichlorvos (red) and Methiocarb (blue). Asterisks illustrate the significant differences between control and substance treatments (*** $p < 0.001$).

Organism



Concentration-response curves: The Y-axis shows the TDM in % of the respective control for each treatment. The X-axis represents the different concentrations used in the treatments. Values are based on the estimated marginal means derived from the GLM with post hoc LSD tests. The graphs show different activity patterns in response to the two different pesticides. The red dot shows the Dichlorvos treatment while Methiocarb is represented by blue squares.



Combined results of behaviour response tests and AChE inhibition assay: The relative enzyme activity (X-axis) is plotted against the relative locomotion activity on Y-axis. Both variables are shown as percent of control. Red dots represent the Dichlorvos treatment whereas Methiocarb treatments are shown as blue squares.

Significant but different behavioural alterations of Dichlorvos and Methiocarb

Inhibition of AChE was not reflected in behavioural tests

Stress/defence reaction

Population

Effects on individual behavioural traits can affect:

- predator-prey,
- reproduction-,
- population dynamics

impact on ecosystem functions

SMALL, ENVIRONMENTALLY RELEVANT TIMEFRAMES AND CONCENTRATIONS REVEAL UNDERESTIMATED EFFECTS

STAY UPDATED

AM RES

1 Goethe University Frankfurt, Institute of Ecology, Diversity and Evolution, Department Aquatic Ecotoxicology, Max-von-Laue-Straße 13, 60438 Frankfurt am Main, Germany
2 Goethe University Frankfurt, Institute of Ecology, Diversity and Evolution, Department of Evolutionary Ecology and Environmental Toxicology, Max-von-Laue-Str. 13, 60438 Frankfurt am Main, Germany
*Correspondence to: Laura J. Soose, e-mail: Soose@bio.uni-frankfurt.de

This work received funding from the Robust Nature Cluster of Excellence Initiative provided by the Goethe University Frankfurt, Germany.