

# IS THE NON-BITING MIDGE *CHIRONOMUS RIPARIUS* A SUITABLE TEST ORGANISM TO STUDY THE EFFECT OF MULTIPLE STRESS?

Katharina Heye\*, Lukas Kruckenfellner, Thorsten Lotz, Matthias Oetken, Jörg Oehlmann

Department Aquatic Ecotoxicology, Goethe University Frankfurt am Main, Germany

\*E-mail: heye@bio.uni-frankfurt.de



## INTRODUCTION

The non-biting midge *Chironomus riparius* is a commonly used model organism for the environmental risk assessment of chemicals. Results mostly from laboratory studies are transferred to the field where organisms have to cope with a wide range of stressors. How can we include these uncertainties into lab studies? To be able to answer this questions we first had to **I identify biotic and abiotic factors that affect *C. riparius*, II find suitable endpoints to combine and evaluate different stressors in parallel, and III check whether the sensitivity to chemical exposure increases with stress.** For this, the antiepileptic drug carbamazepine (CBZ) was used as model substance.

## MATERIALS & METHODS

28-days life cycle toxicity tests with *C. riparius* were conducted in 600 mL test vessels containing 118 g quartz sand, 0.6 g stinging nettle, and 0.6 g black alder leaves (n=4).

Investigated factors were:

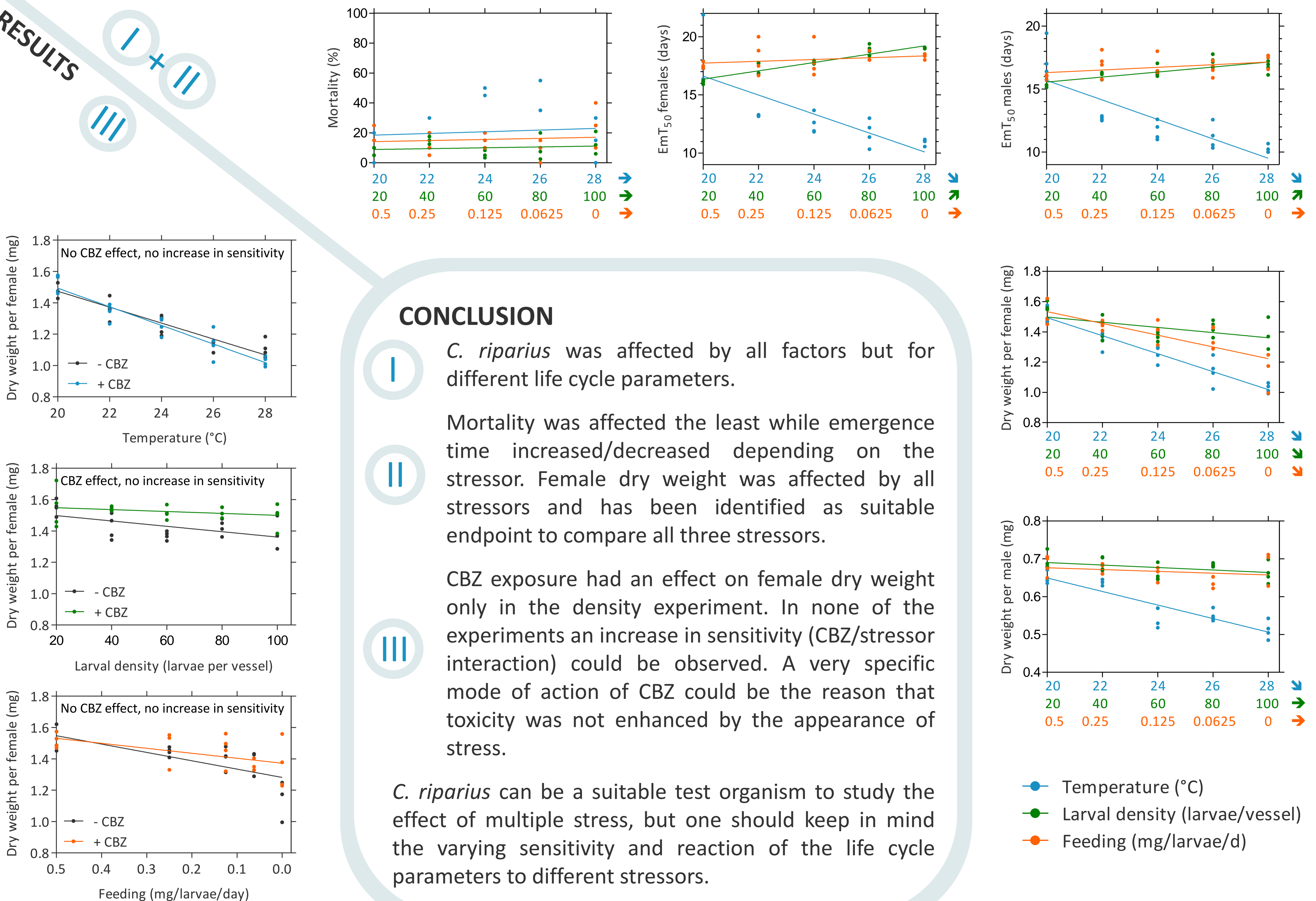
**Temperature:** 20, 22, 24, 26, 28 °C

**Laval density:** 20, 40, 60, 80, 100 larvae per vessel

**Feeding:** 0.5, 0.25, 0.125, 0.0625, 0 mg fish food/larvae/day

Abiotic and biotic factors were tested with and without CBZ (LC<sub>10</sub> level). Mortality, mean emergence time (EmT<sub>50</sub>), and adult dry weight were investigated for each treatment.

## RESULTS



## CONCLUSION

*C. riparius* was affected by all factors but for different life cycle parameters.

Mortality was affected the least while emergence time increased/decreased depending on the stressor. Female dry weight was affected by all stressors and has been identified as suitable endpoint to compare all three stressors.

CBZ exposure had an effect on female dry weight only in the density experiment. In none of the experiments an increase in sensitivity (CBZ/stressor interaction) could be observed. A very specific mode of action of CBZ could be the reason that toxicity was not enhanced by the appearance of stress.

*C. riparius* can be a suitable test organism to study the effect of multiple stress, but one should keep in mind the varying sensitivity and reaction of the life cycle parameters to different stressors.

**Figure 6-9:** The effect of temperature (°C), larval density (larvae/vessel), and feeding (mg/larvae/day) on female dry weight with and without the addition of the LC<sub>10</sub> of CBZ. Linear regression slopes (increase in sensitivity) and intercepts (CBZ effect) were compared.

**Figure 1-5:** The effect of temperature (°C, blue), larval density (larvae/vessel, green), and feeding (mg/larvae/day, orange) on mortality, mean emergence time (EmT<sub>50</sub>), and dry weight as linear regression. Arrows indicate slopes which are significantly (p < 0.05) different from zero (↗, ↘) or not (→).