

Effects of a fungicide and a herbicide mixture on the food web structure of a benthic community and the fitness of the omnivore *Gammarus roeselii* in a microcosm experiment.

Umwelt
Bundesamt

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Introduction

Fungicides and herbicides are commonly found in aquatic systems occurring in mixtures. Current pesticide risk assessment focuses mainly on single pesticide effects. Therefore, we assessed the effects of mixtures on a food web of a benthic community and the fitness of the omnivore *G. roeselii*.

Material and methods

Model scenario

- 9 microcosms
- 3 fungicides
- 3 herbicides
- 6 concentrations
- 1 application of fungicides, herbicide application 30 d afterwards

control

0.1*NOEC

3*NOEC

control

0.03*NOEC

NOEC

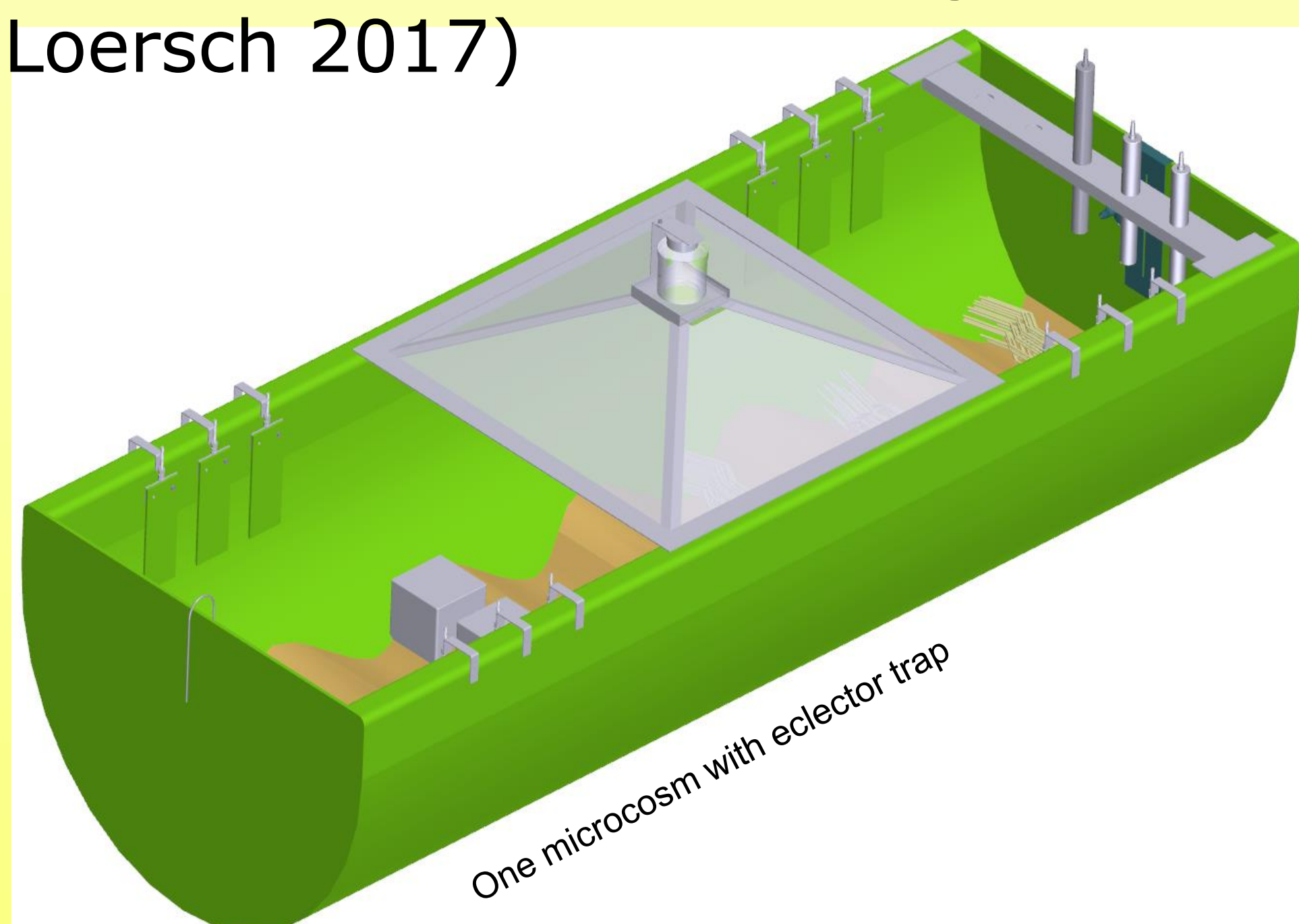
control

RAC

0.3*NOEC

Measured parameters (selection)

- Fitness parameters of *G. roeselii*: RNA:DNA ratio, triglyceride concentrations (Wagner et al. 2001, Koop et al. 2008)
- Stable isotope analysis SIA of $\delta^{15}\text{N}$ & $\delta^{13}\text{C}$ for trophic level [TL] (see Brauns et al. 2012)
- Bayesian standard ellipse areas (SEA_B) (see Jackson et al. 2011)
- Benthic community and emergence (rf. Loersch 2017)



Microcosms at the artificial pond and stream mesocosm facility (FSA, Umweltbundesamt)

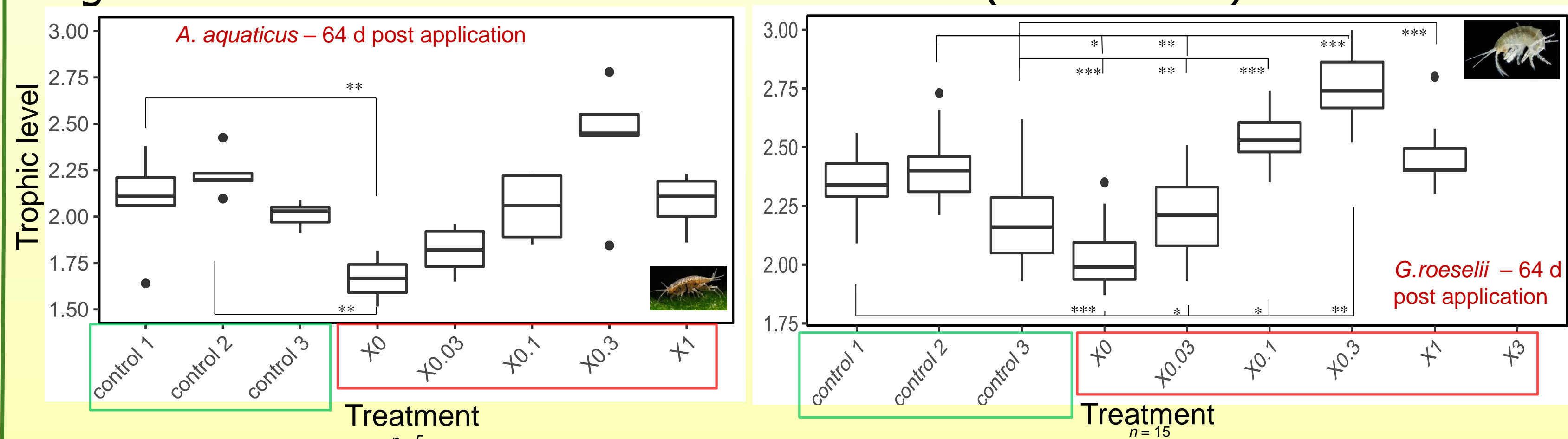
First Results

1. RNA:DNA and Triglycerides of *Gammarus roeselii*

No significant differences in any of both parameter at any time, neither for female, nor male *G. roeselii*.

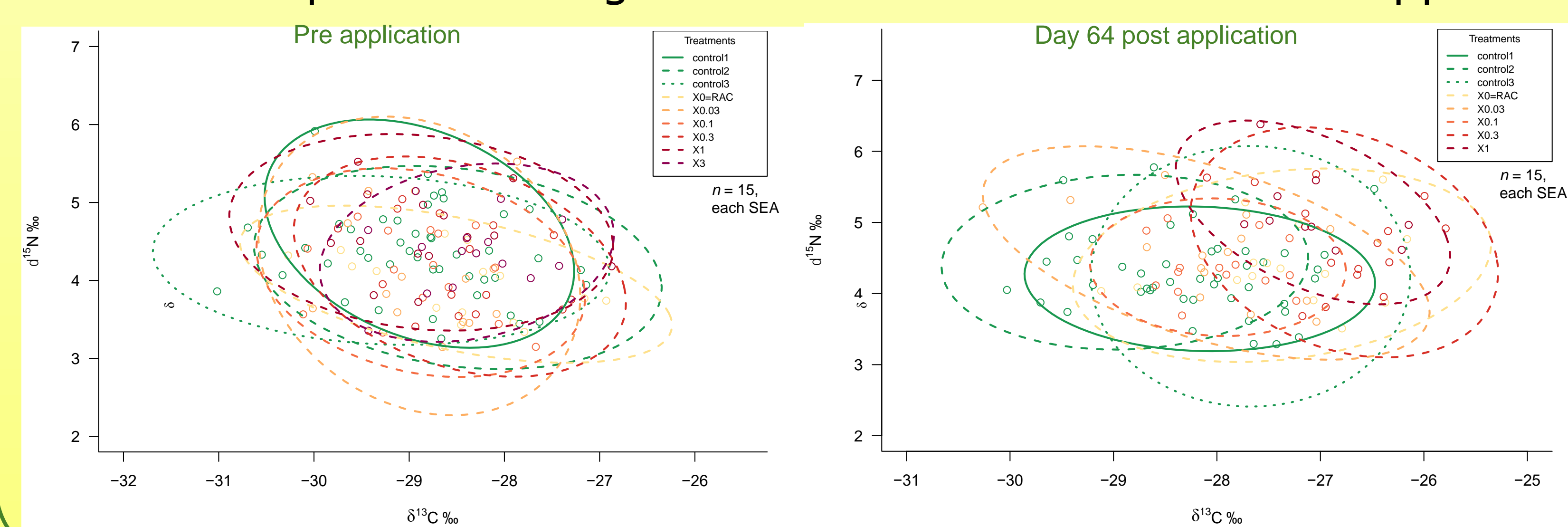
2. Trophic Levels of *G. roeselii* and *A. aquaticus*

Significant lower trophic levels at RAC-treatment and significantly higher treatment at 0.3*NOEC-treatment (*G. roeselii*).



3. Isotopic niches of *G. roeselii*

Lower overlap between high treatments and controls after application.



Summary

- ✗ No significant decrease in fitness parameters after 64 days pesticides mixture exposure
- ✓ Changes in food web structure determined by stable isotope analyses → indirect effects

Preliminary conclusion

- ? Long time exposure scale at low concentrations (RAC)?
- ? Consequences for ecosystem integrity, food webs, matter fluxes (terrestrial ↔ aquatic) .

Questions remaining

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Photo Sources:

https://en.wikipedia.org/wiki/Gammarus_roeselii#/media/File:Gammarus_roeselii.jpg,

<https://alchetron.com/Asellus-aquaticus-1763858-W#demo>

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