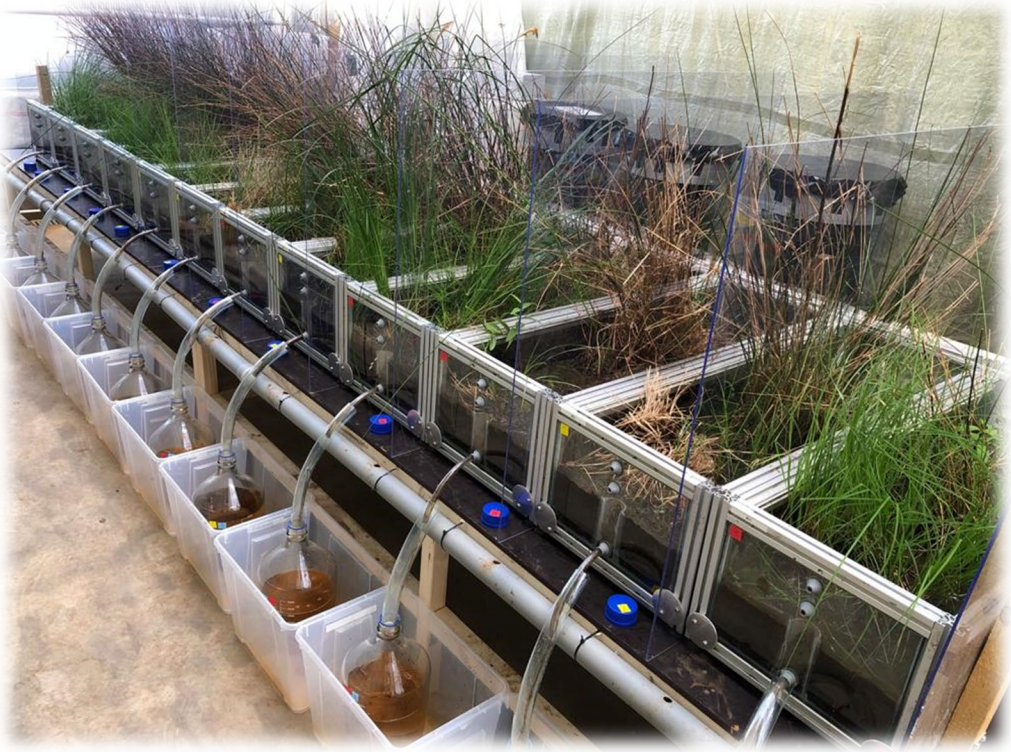
Mesocosm studies using nanoplastics



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Nano-plastics (NPs)

Nano Polystyrene (PS)

Toxic to aquatic organisms:

- Chlorophyta (Green algae)
- *Daphnia magna*
- Fish
- Trophic web transfer

Mattsson et al. 2017. *Scientific Reports*.
Nasser, F. & Lynch, I. 2016. *Journal of Proteomics*
Besseling et al. 2014. *Environmental Science & Technology.*
Kelpsiene et al. 2020. *Scientific reports.*

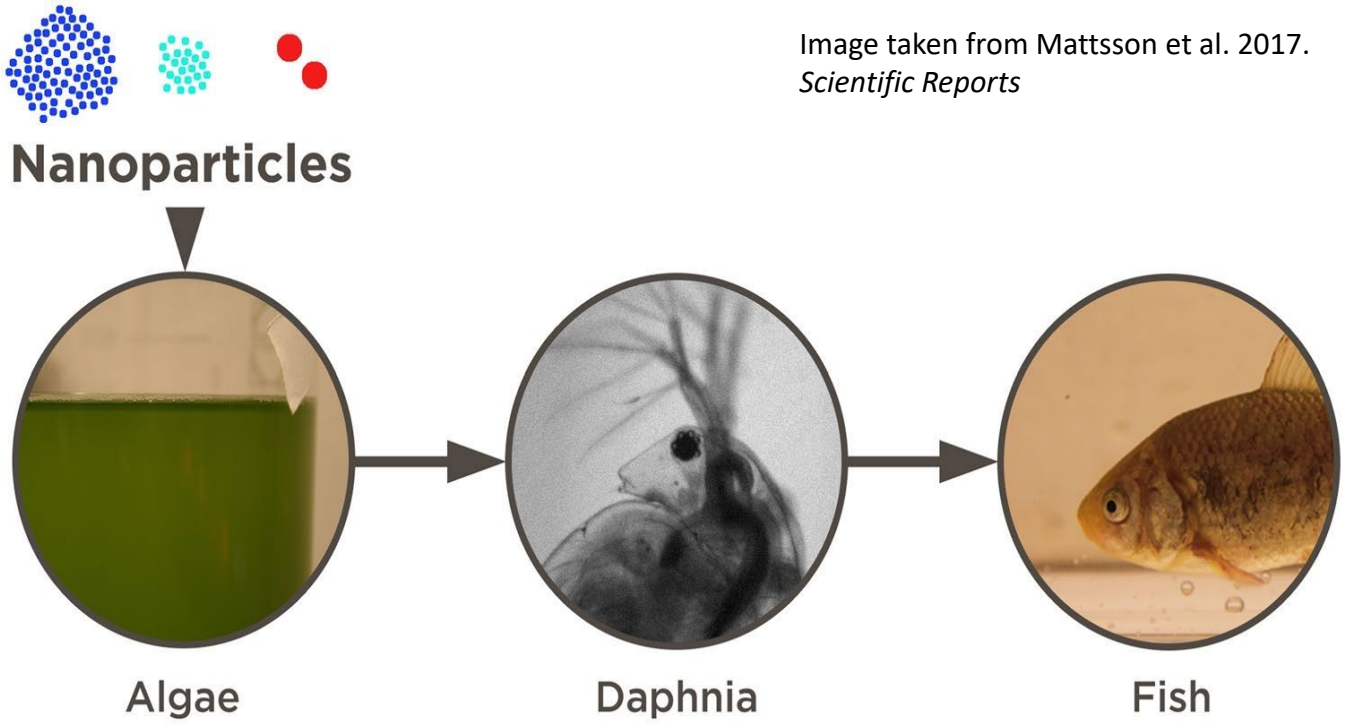
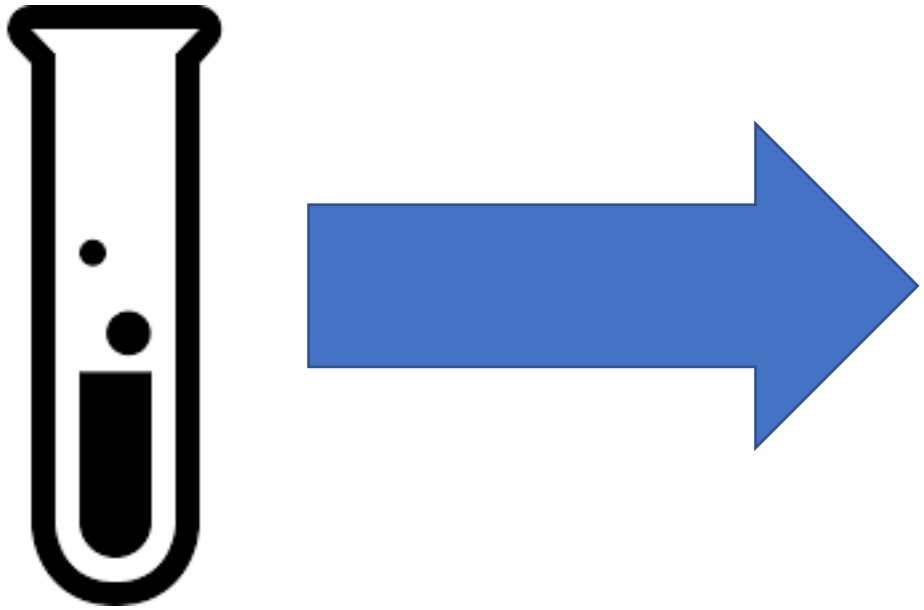


Image taken from Mattsson et al. 2017. *Scientific Reports*

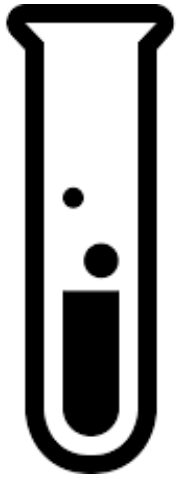
Previous studies generally at the **lab scale**

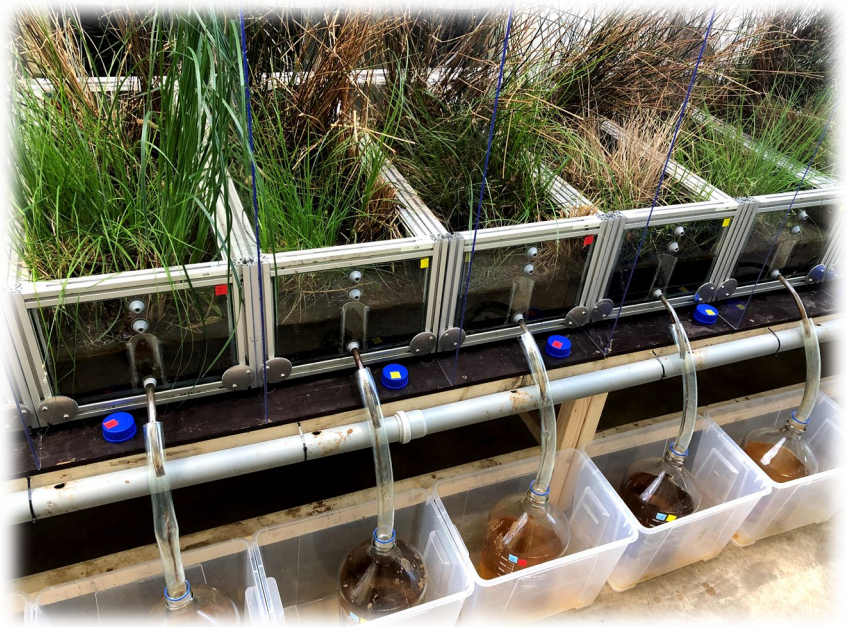


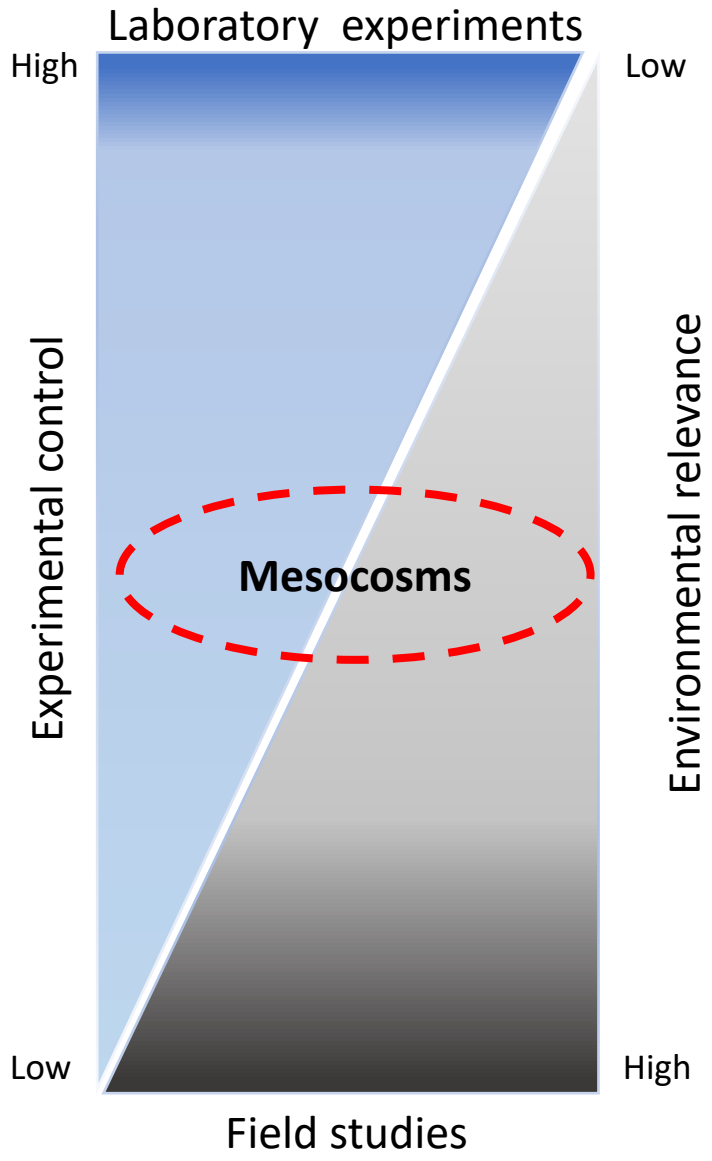
What happen in nature?
Fate and effects of NPs in a more “natural ecosystem”?
How to track the NPs?

Mesocosms

- Natural environment under controlled conditions
- Link laboratory experiments with filed studies
- Multiple trophic levels
  - Organisms interactions
- Takes several biological and chemical processes into account

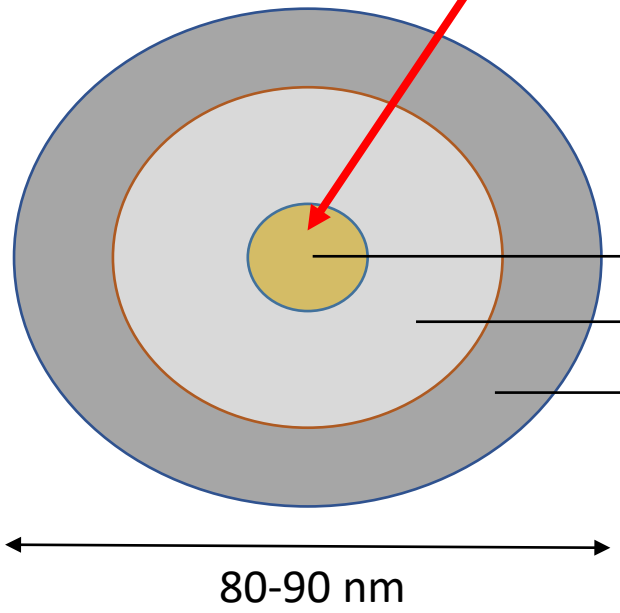


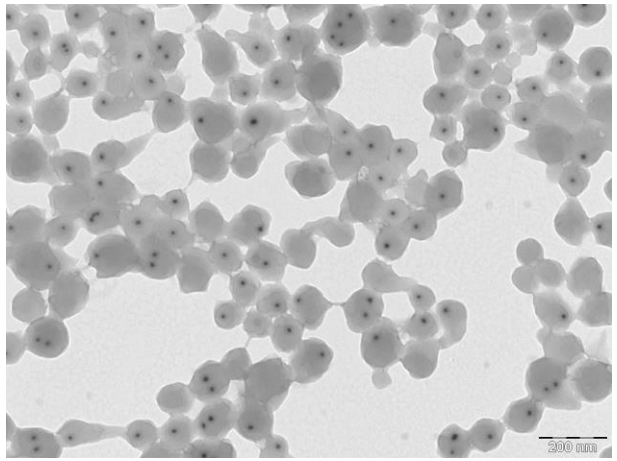


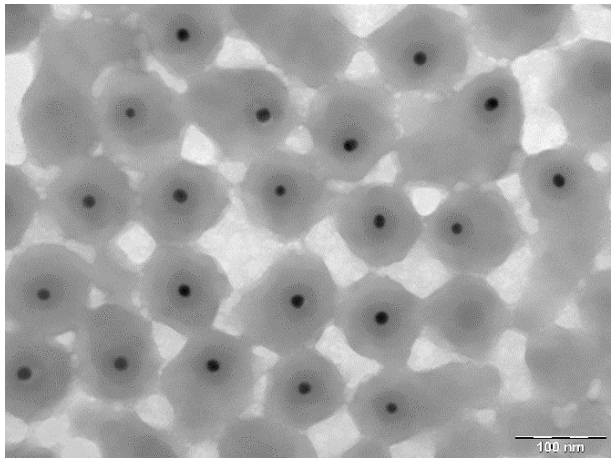


Major challenge NPs in nature: quantification!
How to quantify what we cannot measure?

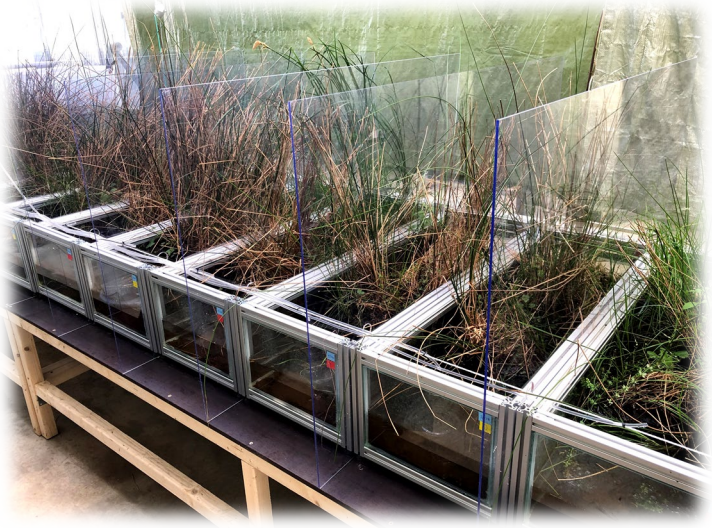
Can be quantified!

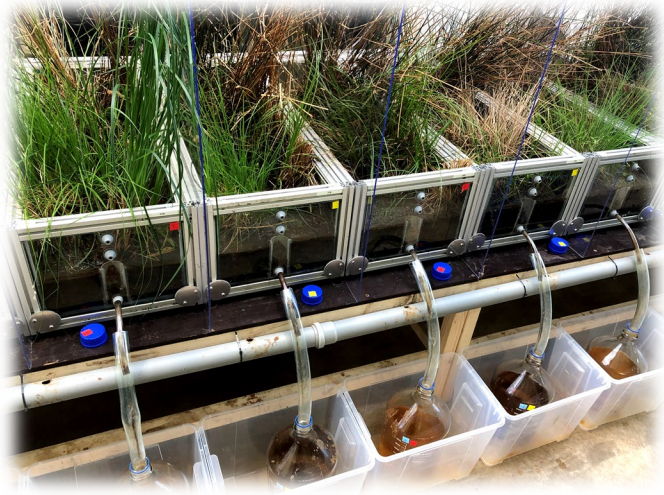


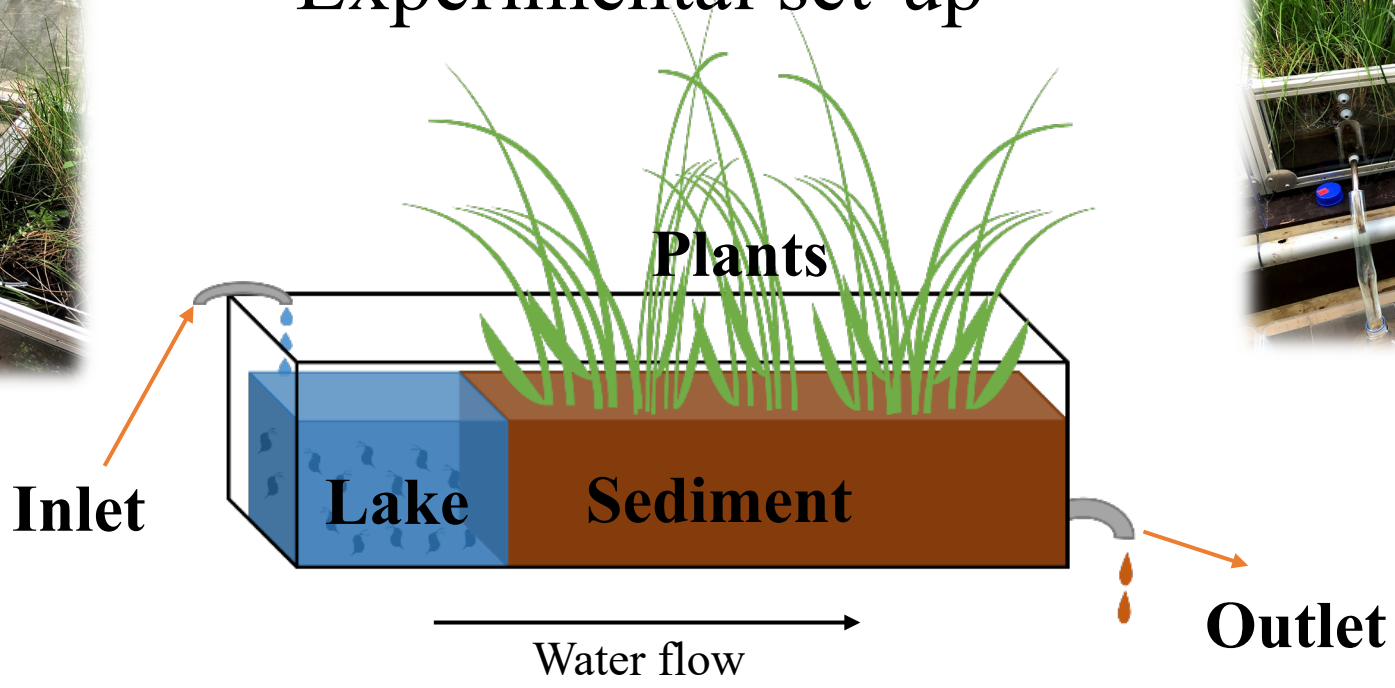




Experimental set-up







6 controls
6 treatments with NP

Constant flow of water (3 ml/min)

10 weeks of exposure

20 *D. magna* and 10 *A. aquaticus* added per mesocosm

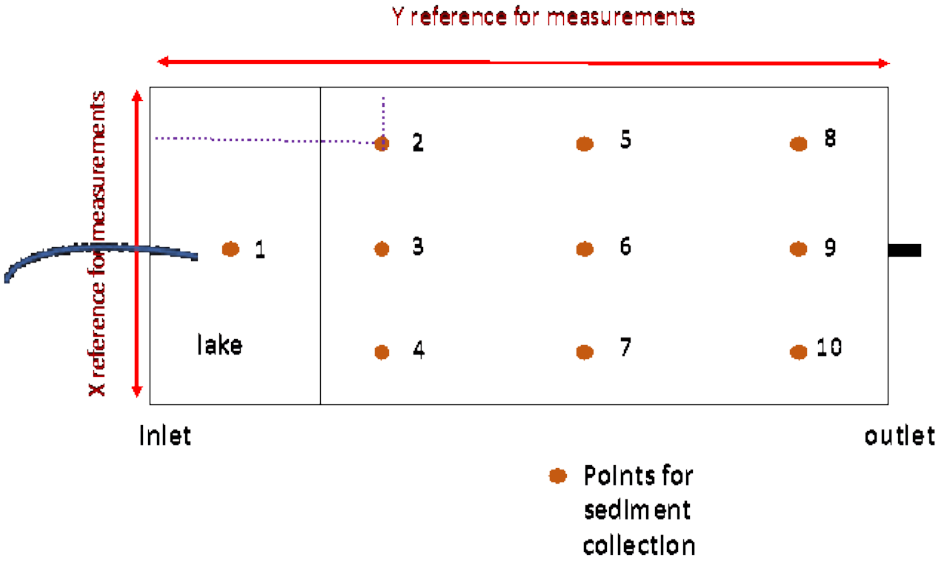
Algae added 3 times a week as food for *Daphnia*

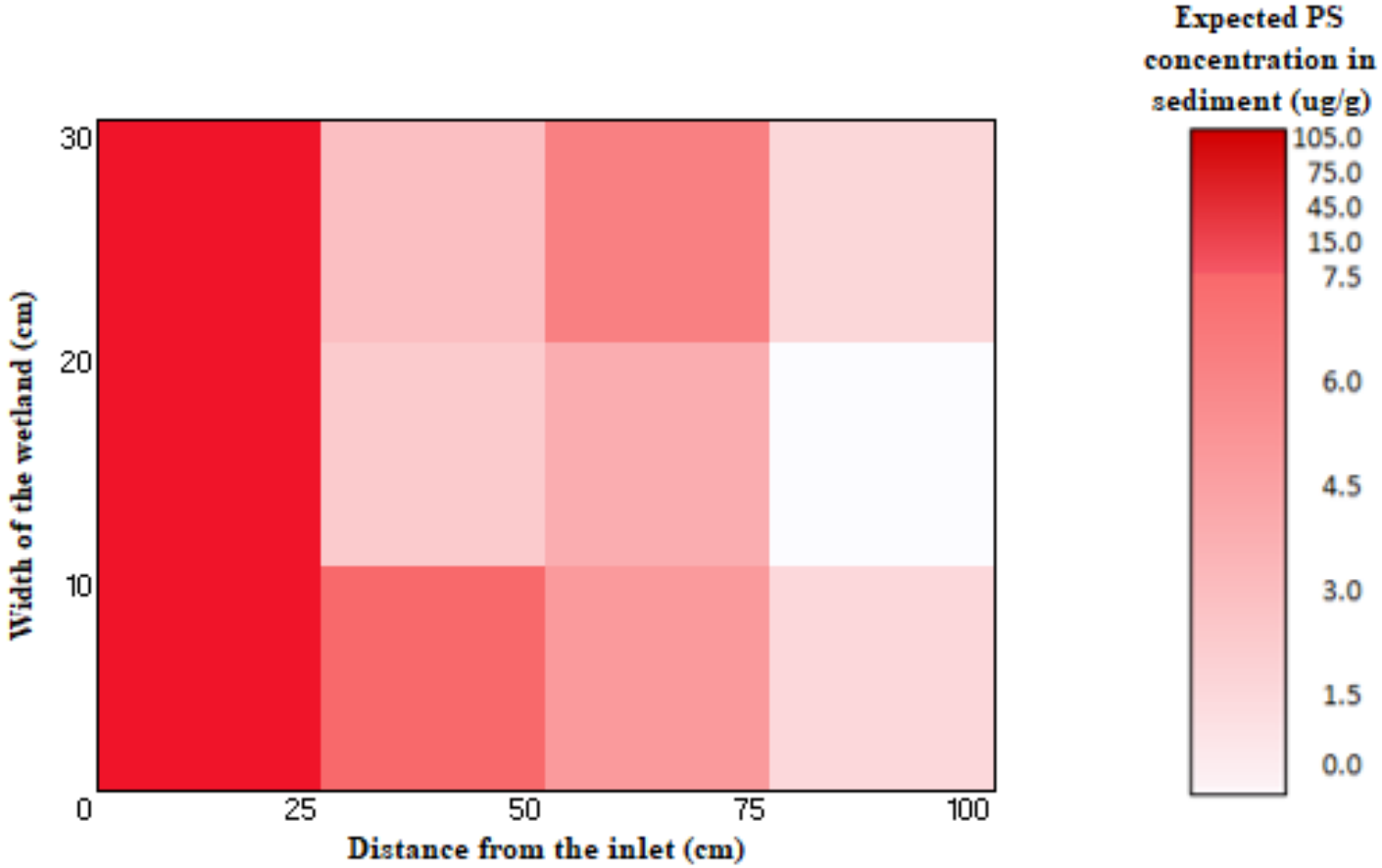
NP addition

≈1.72 mg plastic/week

NPs fate in the ecosystem

Sediment distribution

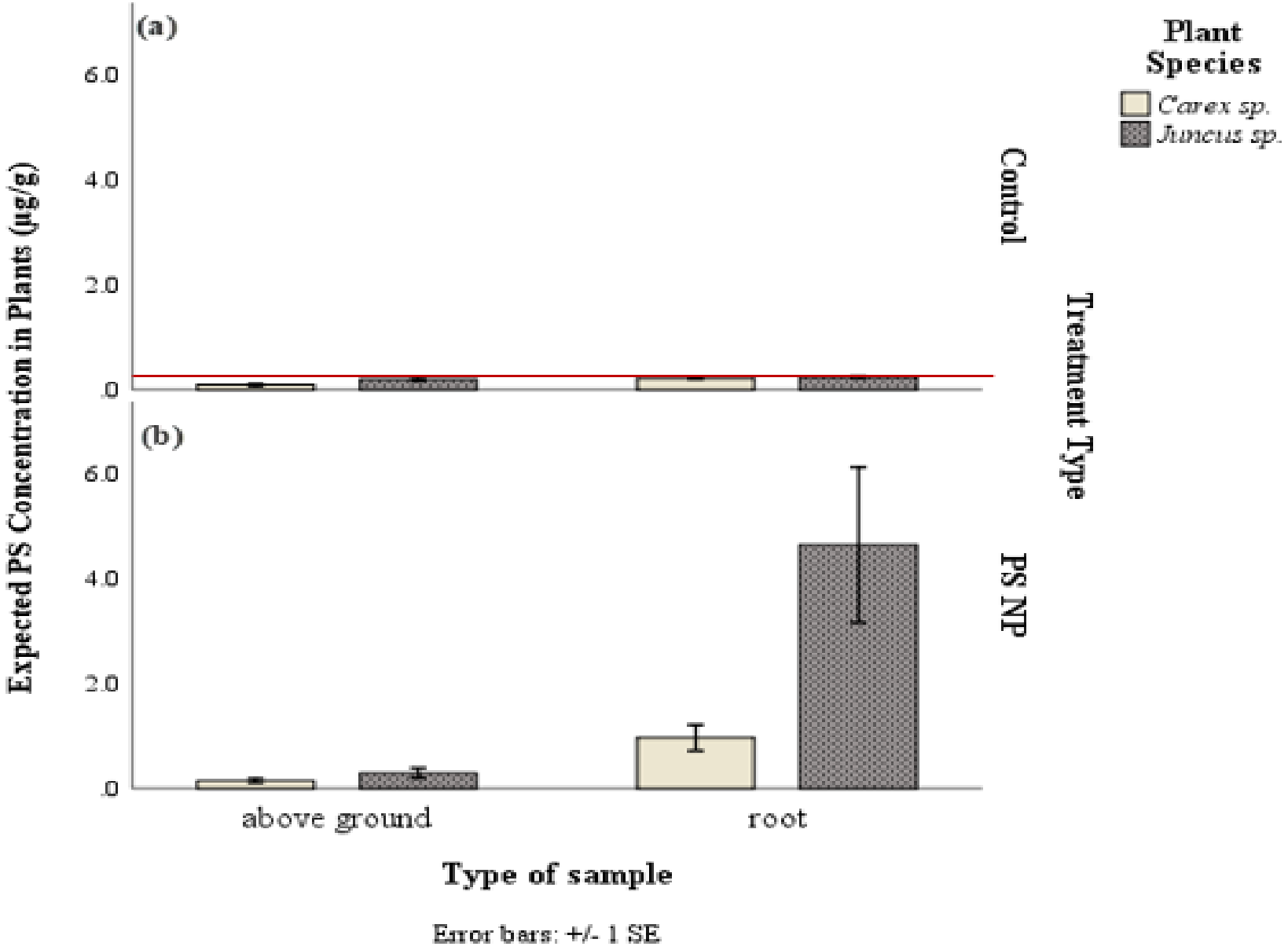




Average gold concentration between the different sediment sampling points for treatment mesocosms

NPs fate in the ecosystem

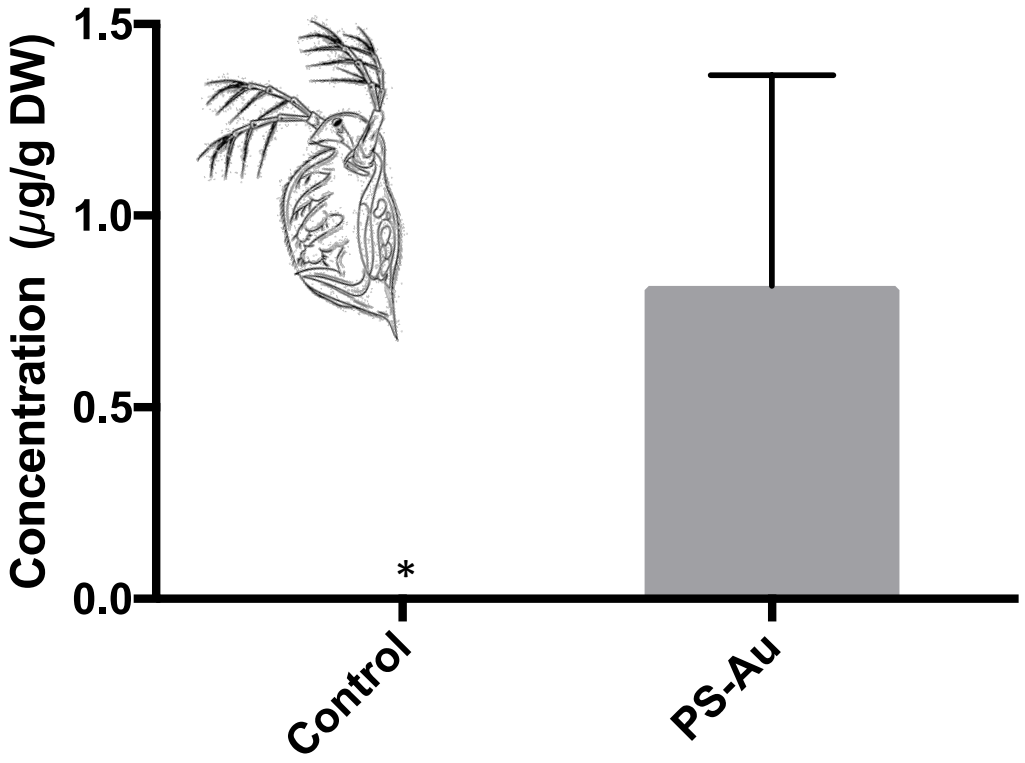
Presence in plants



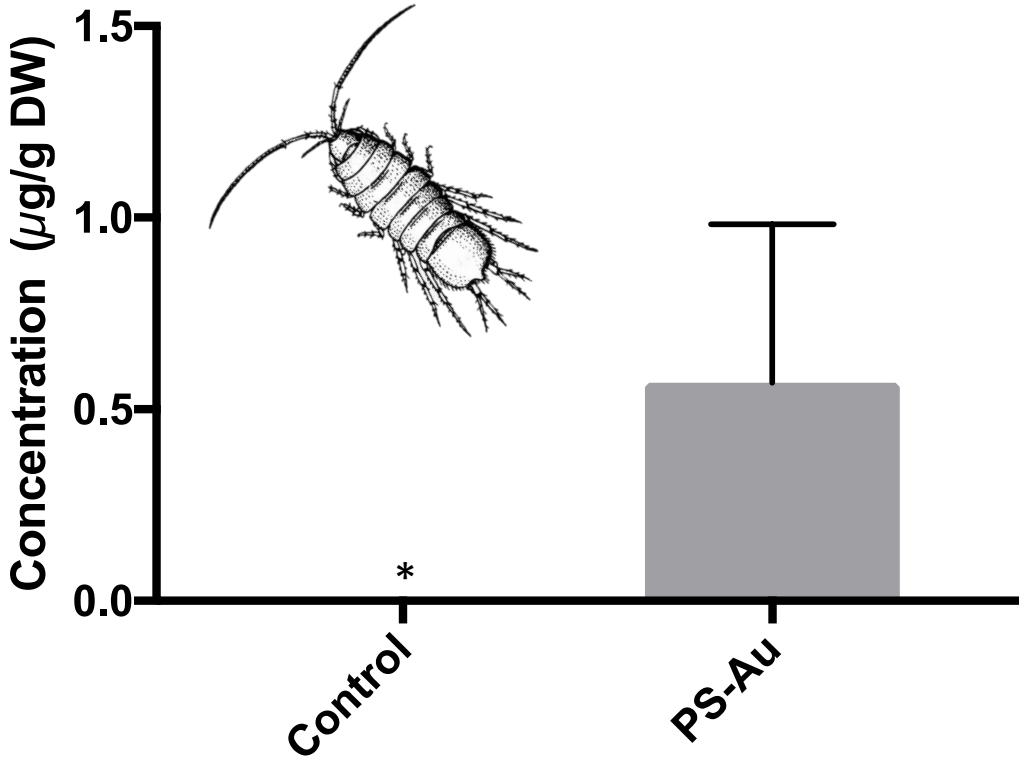
NPs fate in the ecosystem

Presence in animals

Daphnia magna



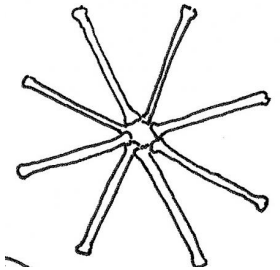
Asellus aquaticus

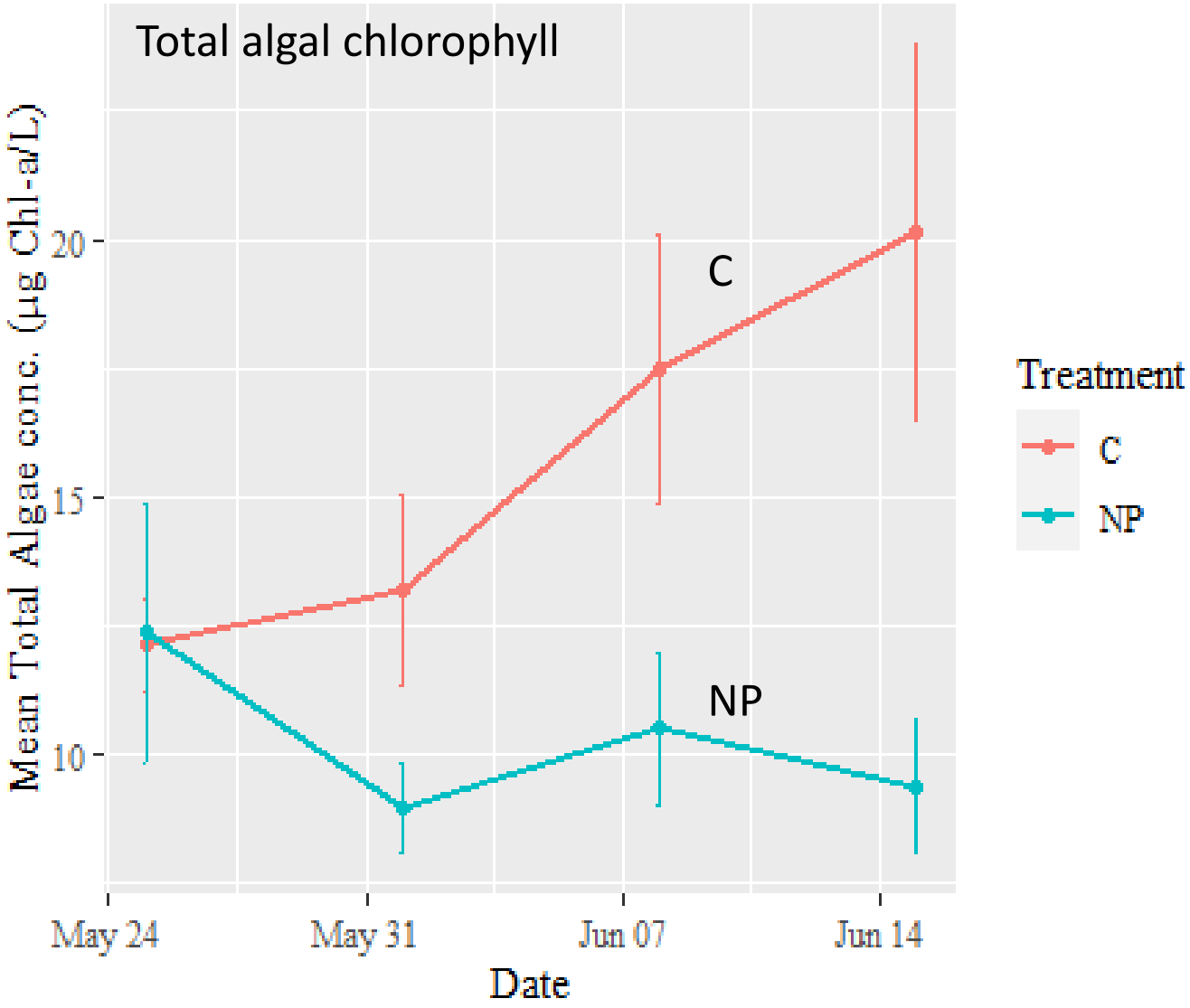


*Below detection limit

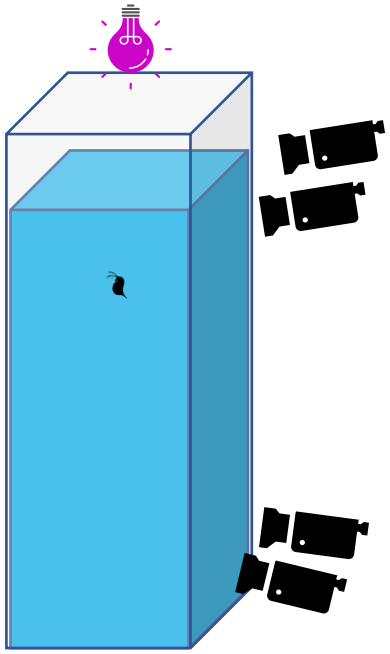
Significant uptake of NPs in the exposed individuals

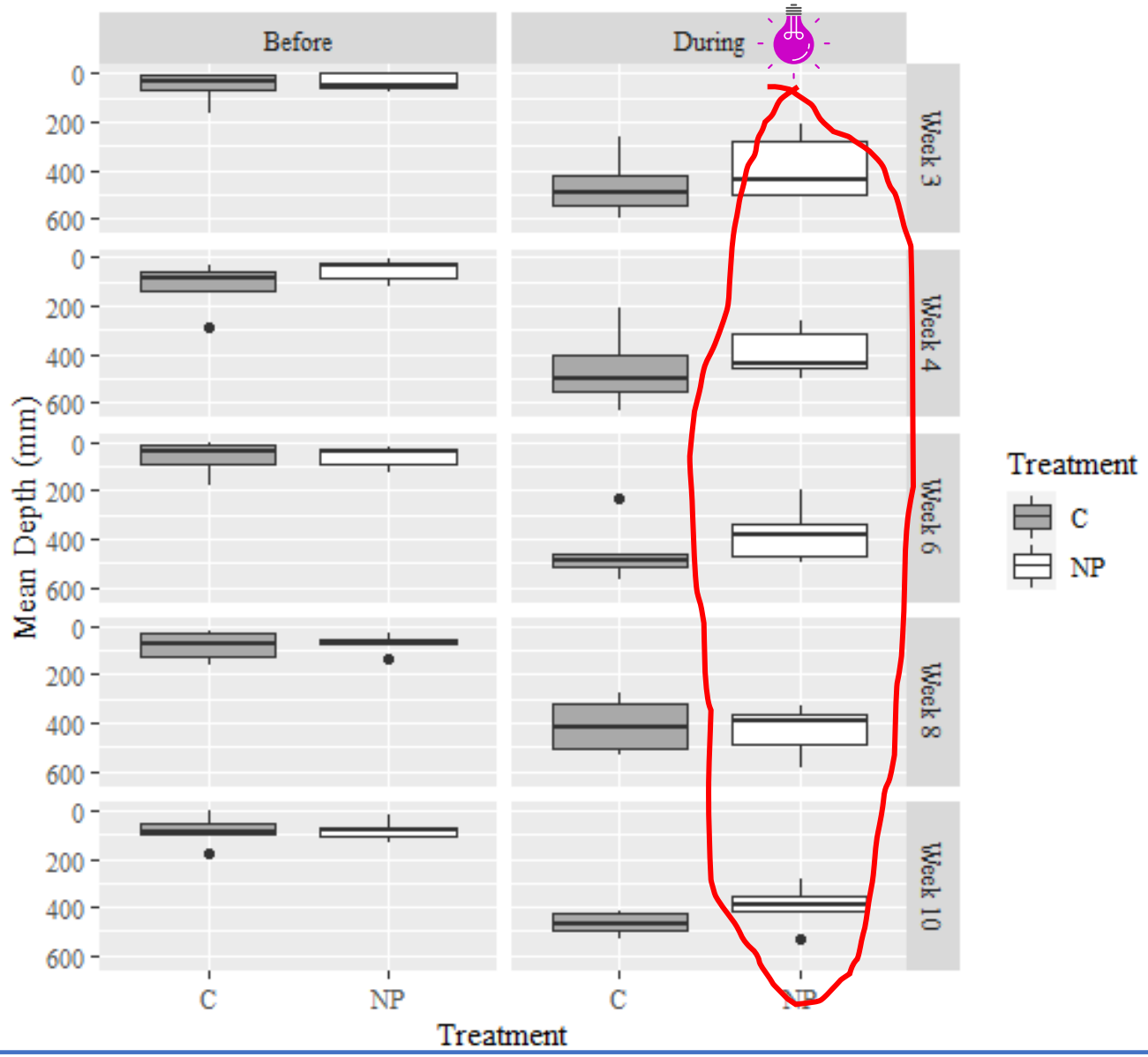
Phytoplankton community





D. magna swimming behaviour

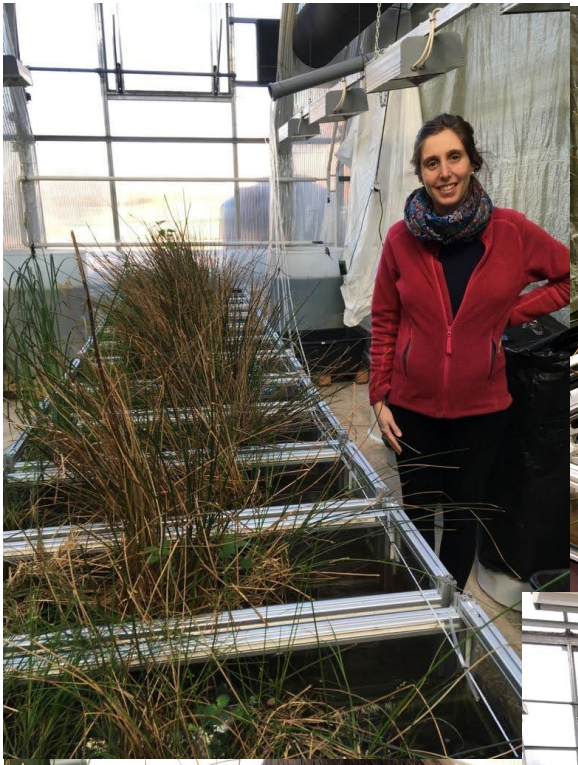
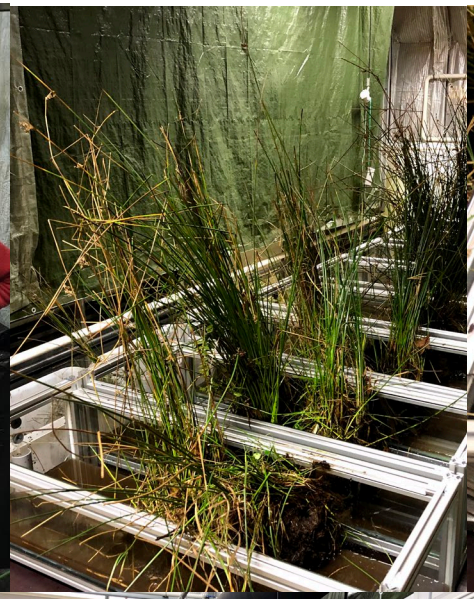
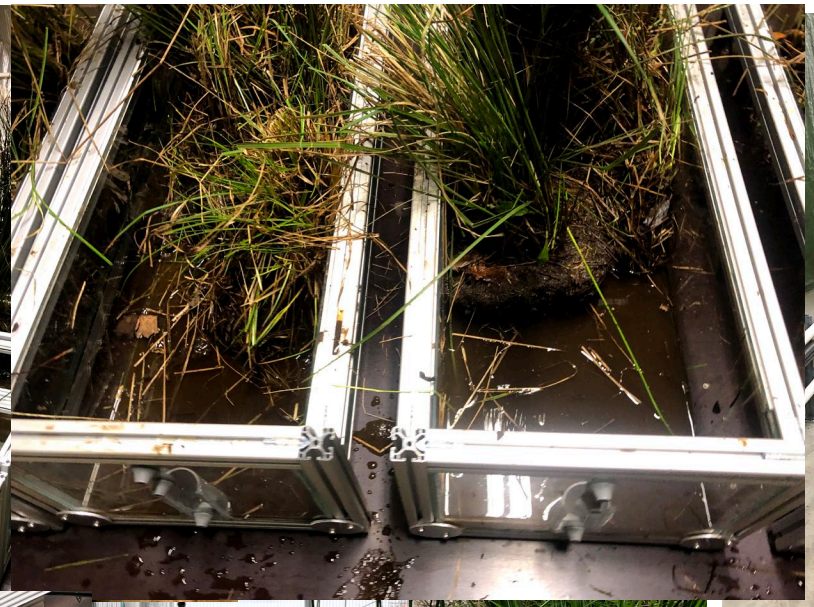


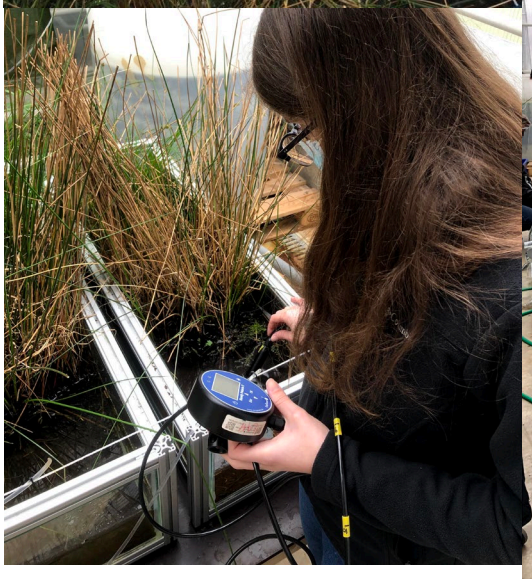


A trend in Swimming Depth (During UV). NP exposed individuals swam less deep during UV exposure

Conclusions

- Mesocosm studies allows for more environmentally realistic exposure scenarios
- Enables linkage between “the lab” and the “real world”
- Track the fate of the nanoparticles
- Uptake in plants and organisms
- Effects on phytoplankton community
- Trends for sublethal effects on *D. magna*



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Thank you!