

Investigating the Trojan horse effect of nanoparticles on an aquatic community – An outdoor mesocosm study

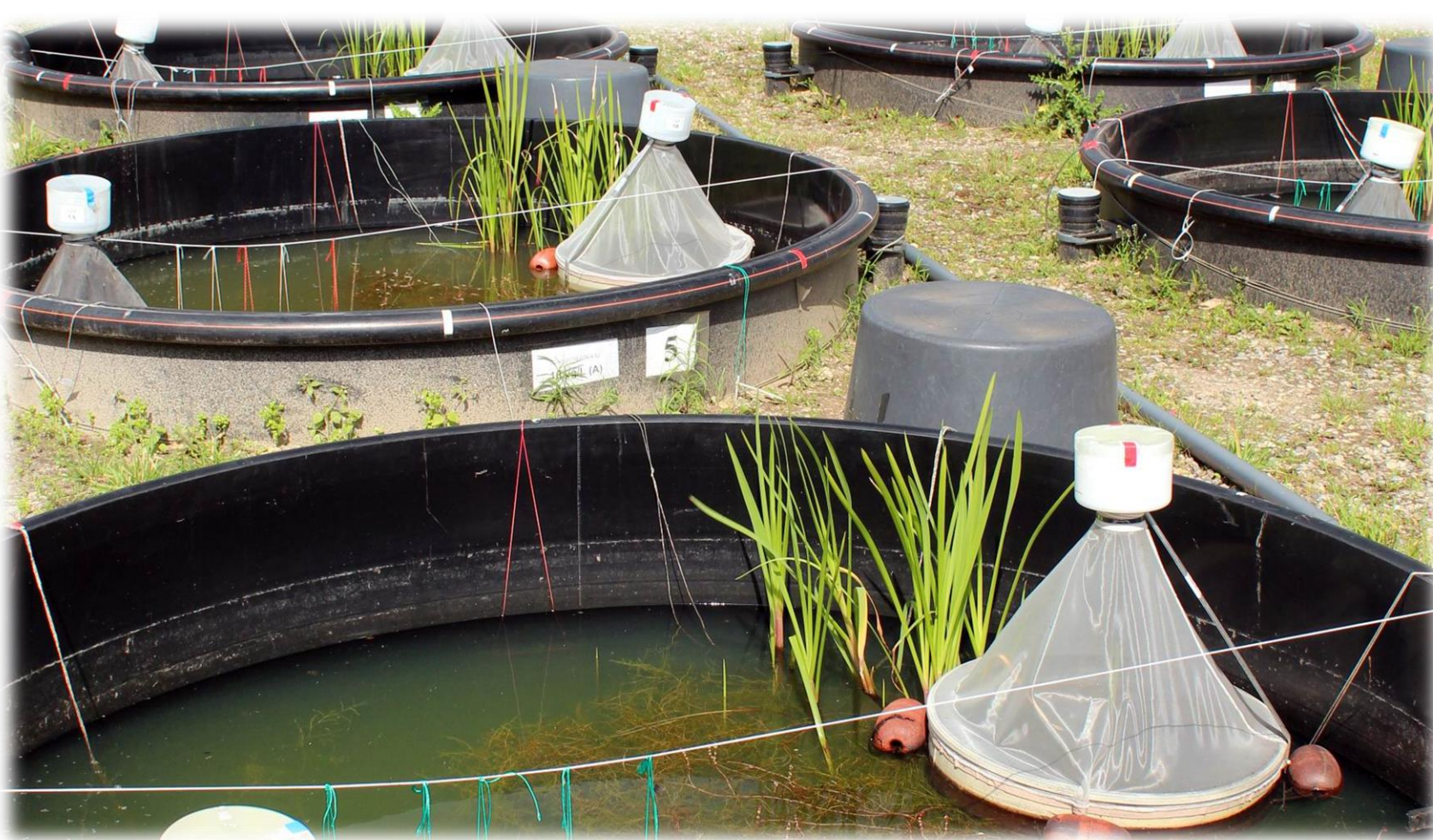
T. Strauss, S. Classen, T. Knautz and M. Hammers-Wirtz (strauss@gaiac-eco.de)
 Research Institute for Ecosystem Analysis and Assessment - gaiac, Aachen, Germany

Investigating the effects of carbon based manufactured nanomaterials (C-MNMs) on aquatic communities and their role as carrier of toxicants (Trojan horse effect)

How will fullerenes affect aquatic communities over a longer time period?
 Will the presence of fullerenes alter the effect of the biocide triclocarban (TCC)?

Study design

Outdoor facility with 12 artificial ponds of 3 m³ volume (1m water depth)



Test compounds

Fullerenes (C60)
 Biocide triclocarban (TCC)

Treatments

- Control (4 replicates)
- C60 nominal 20 µg/L (3 replicates)
- TCC nominal 20 µg/L (3 replicates)
- C60 + TCC nominal 20 µg/L each (2 replicates)

Sampling of

- Plankton
- Macroinvertebrates
- Test compounds

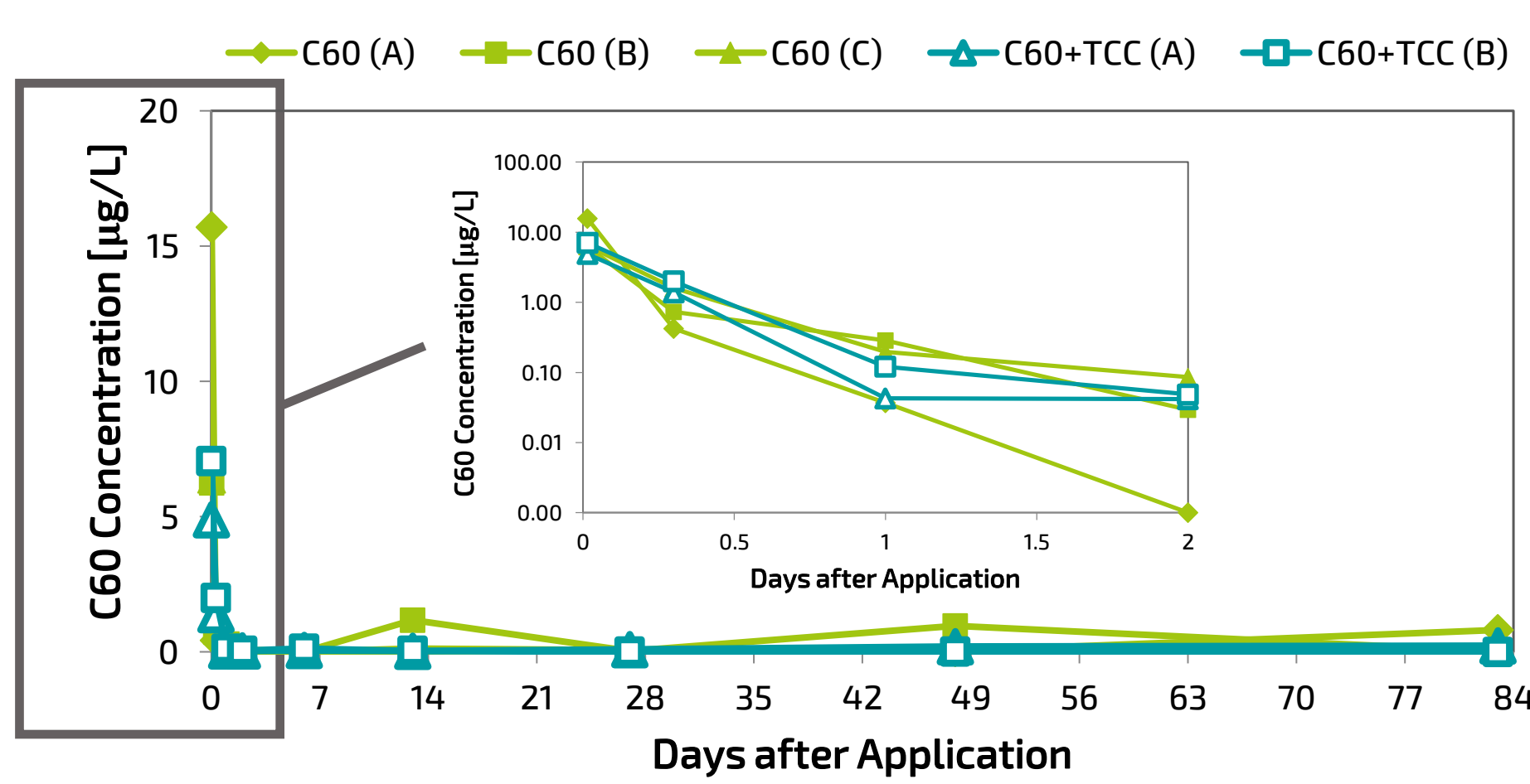


Figure 1: Fate of fullerenes (C60) in the water phase over the test period (84d)

Fate of the test compounds (Preliminary results)

- Fast dissipation of fullerenes in the water column by sedimentation and adsorption (Fig.1)
- Reduced concentration of triclocarban in the presence of fullerenes (Fig. 2)

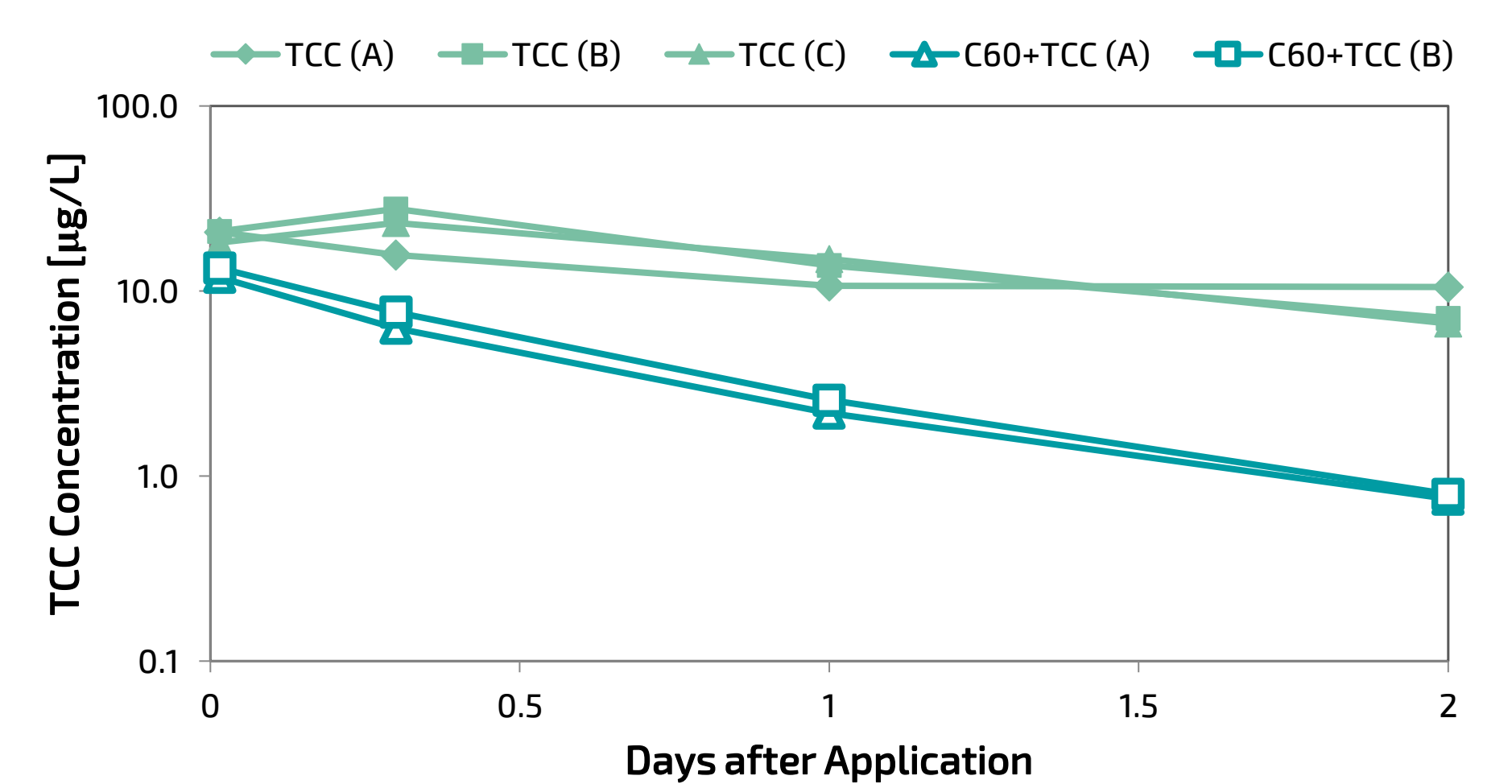


Figure 2: Fate of triclocarban (TCC) in the water phase over the first 48 h

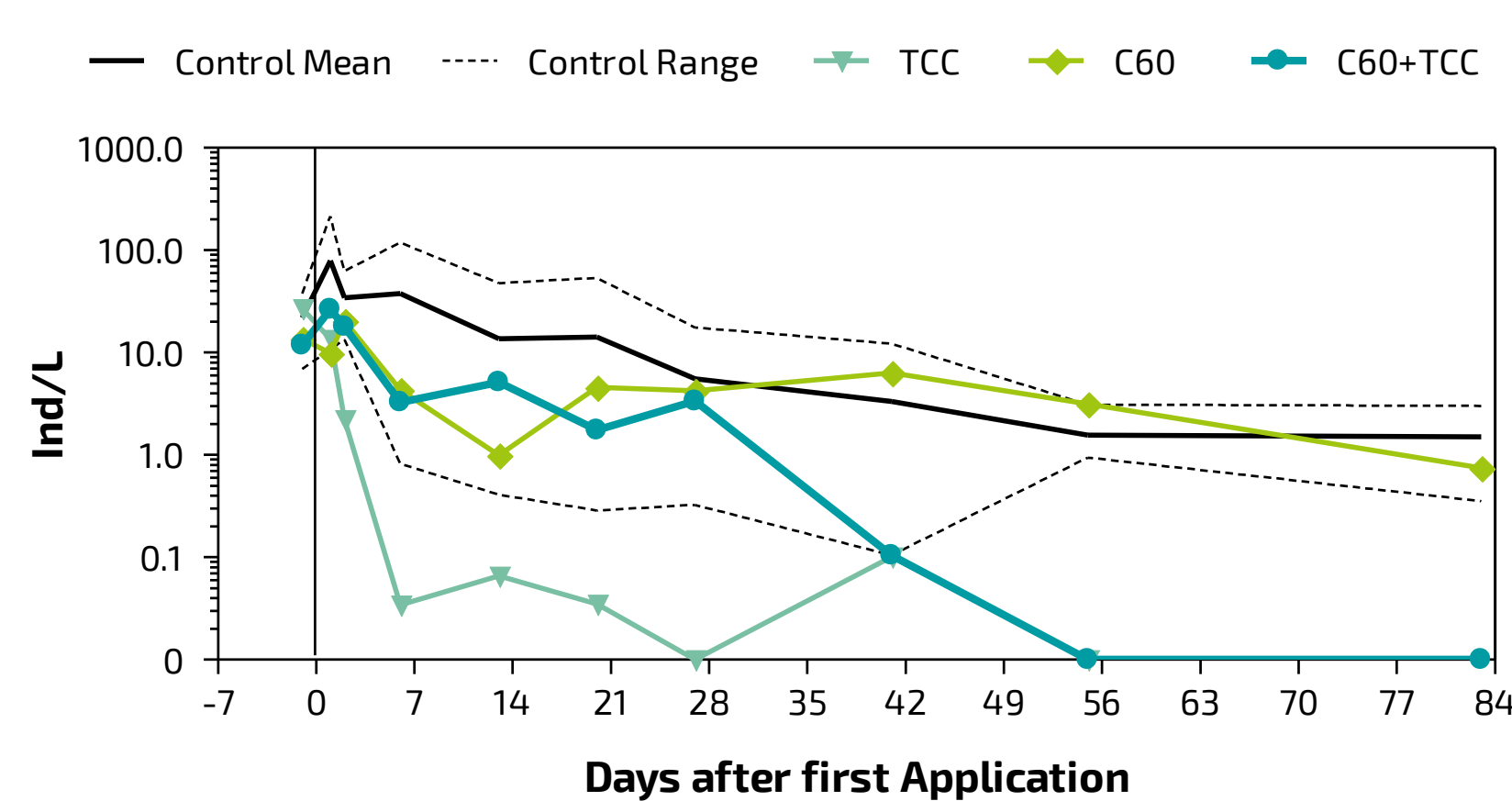


Figure 3: Mean abundance of *Daphnia magna* during the study

Effects (Preliminary results)

- Direct effects of triclocarban on *Daphnia magna* (Fig. 3), followed by indirect promoting effects on phytoplankton and rotifers (Fig. 4 – 5)
- Reduced effects on *Daphnia magna* in the combined treatment (TCC + C60) (Fig. 3)
- Slight reduction of phytoplankton (measured as chlorophyll-a concentration) in both fullerene treatments (C60, C60+TCC)
- No effects on benthic macroinvertebrates (e.g. tubificid worms, Fig.6) and emerging insects

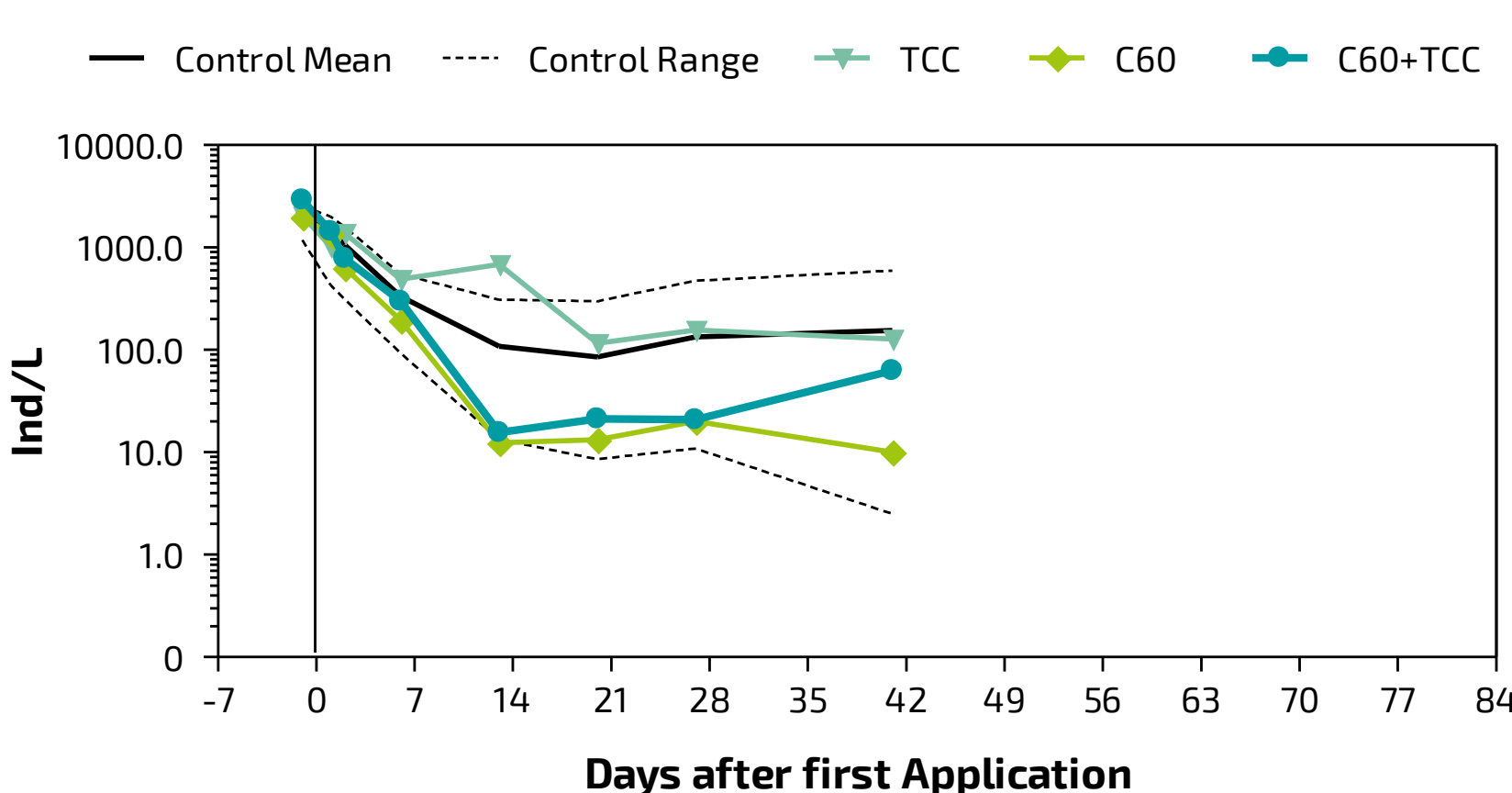


Figure 4: Mean abundance of rotifers during the study

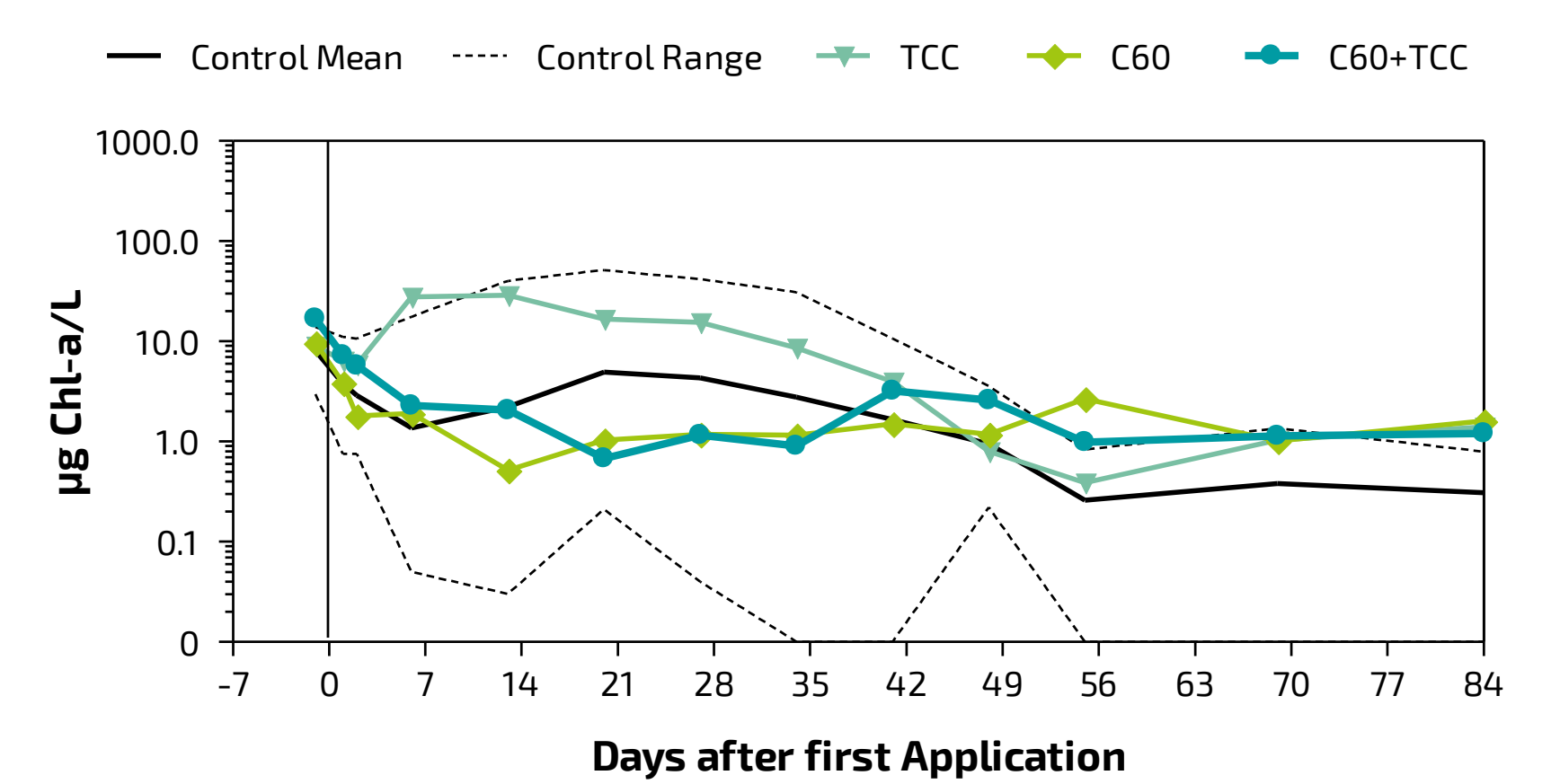


Figure 5: Mean chlorophyll-a concentration during the study as a surrogate parameter for phytoplankton biomass

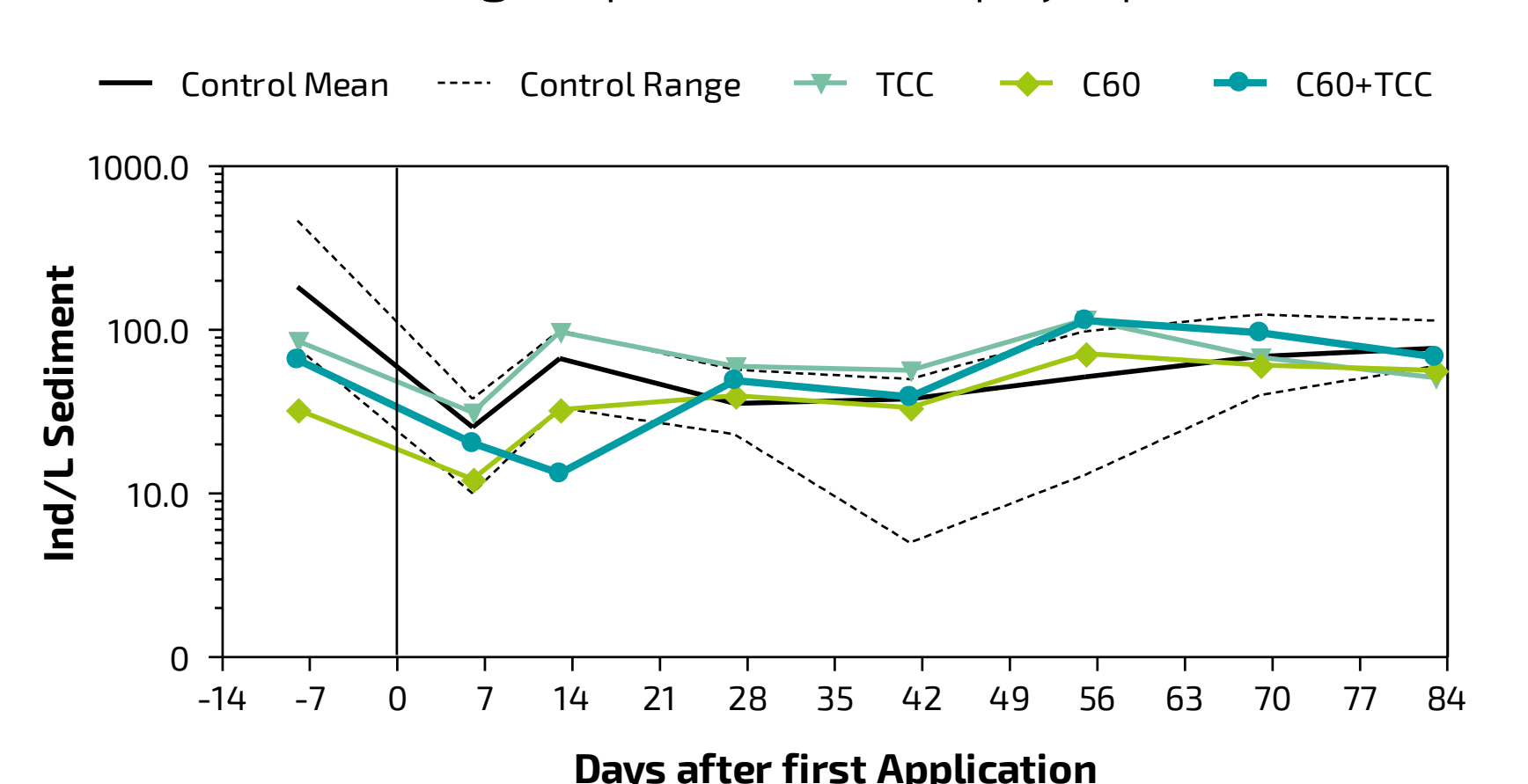


Figure 6: Mean abundance of tubificid worms during the study

Preliminary conclusions

- The presence of fullerenes reduces the direct effects of TCC on *Daphnia magna*
- No observable shift of effects from the water phase to the sediment
- A negative impact of fullerenes on phytoplankton can not be excluded