Zooplankton Community Responses to a Toxic Perturbation in a Mature Lentic Mesocosm

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Experimental mesocosms allow the determination of fate and effects of chemicals in semi-natural systems. This poster presents the results of a static outdoor mesocosm study carried out at Cambridge Environmental Assessments (CEA) to determine the effects of a synthetic insecticide on a natural community of zooplankton.

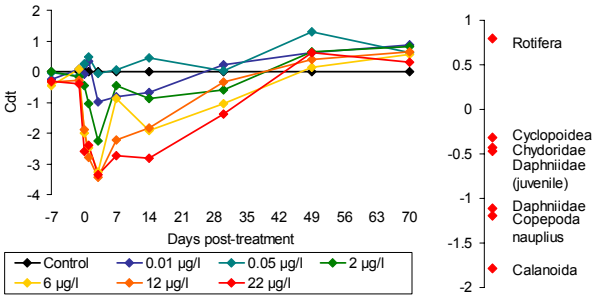
Mesocosm design

- The mesocosm facility at CEA comprises six enclosures (11 x 7 m).
- Aquatic communities have been allowed to develop for a minimum of three years with no chemical treatments.
- Established communities of zooplankton, phytoplankton and macroinvertebrates were present prior to the start of the study.

Study design

- One enclosure was subdivided into 18 discrete enclosures, each one metre diameter and containing 1,000 litres of water.
- Prior to the start of the study the zooplankton community was dominated by Copepoda, particularly nauplii and immature individuals, and Rotifera.
- Treatment concentrations represented a wide range of exposure conditions including PECs associated with diverse agricultural uses.

Results



- The insecticide dissipated rapidly, with the lowest concentration below the limit of detection on the day of application. All concentrations were below the limit of detection by Day 14.
- NOEC and $NOEC_{community}$ for zooplankton data were calculated using Analysis of Variance (ANOVA), Principal Response Curves (PRC) and Redundancy Analysis (RDA).
- No differences were observed between treatments prior to dosing.
- Clear dose-response effects in zooplankton communities were evident three hours post application.
- Copepoda nauplii decreased in abundance relative to controls from Day 0.
- Calanoida and Daphniidae adults also decreased in abundance, Rotifera increased in abundance
- No significant differences in zooplankton communities between treatments after Day 30.

Mesocosm interpretation

- Copepoda nauplii, Calanoida and Daphniidae adults all decreased in abundance in treated enclosures relative to the control enclosures, whereas Rotifera increased in abundance.
- The rapid degradation of the insecticide in the water phase allowed taxa with short lifecycles (i.e. Copepoda) to recover quickly with no significant effects observed after Day 14.
- The responses of all measured biological compartments were considered in the recommendation of an Ecologically Acceptable Concentration (EAC).