

# BEHAVIOURAL RESPONSES AND SURVIVAL OF LARVAE OF THE RIVERINE CADDISFLY *HYDROPSYCHE ANGUSTIPENNIS* EXPOSED TO COPPER

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## INTRODUCTION

Biodiversity of river ecosystems in western Europe decreased dramatically during the past century and especially the number of aquatic insects has strongly declined. Therefore, aquatic insects can be useful for indicating ecological recovery. In order to identify key factors limiting the distribution of aquatic insects, interacting effects of natural and man-made stress factors must be disentangled. Within the framework of this objective, the aim of this study was to determine the effects of a model toxicant, copper, on larvae of the riverine caddisfly *Hydropsyche angustipennis* and to examine if copper concentrations in large European rivers may affect this species.

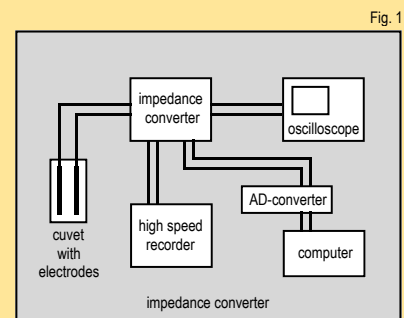
## EXPERIMENTAL SETUP

### survival

- 20 first instar larvae
- 1 control, 6 to 8 copper concentrations
- glass vessel, 100 ml Dutch Standard Water
- food: nettel broth (*Urtica*)
- after 48, 96 or 168 hour determination of survival

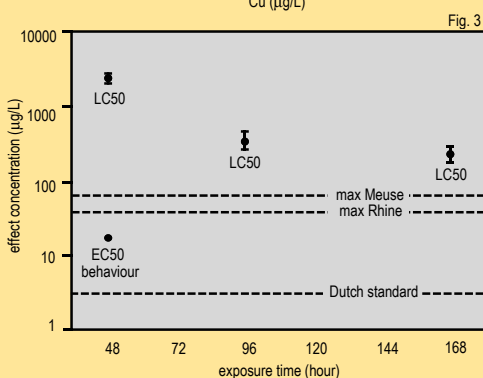
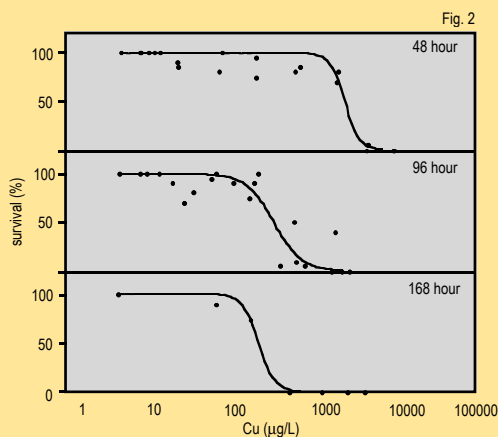
### behaviour

- 10 fifth instar larvae
- 1 control, 6 copper concentrations
- 48h exposure, 1h registration using an impedance converter (fig. 1)
- determination of differences in time spent on ventilation, resting and other activities



### survival

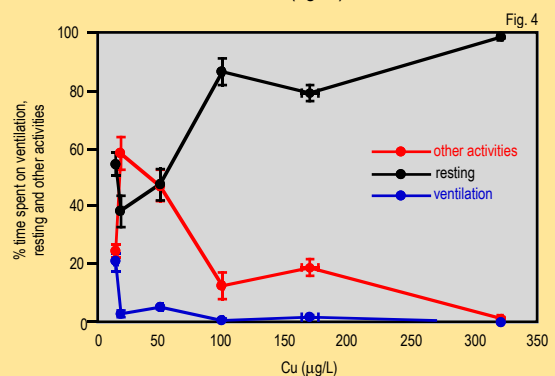
Clear dose-response relationships were observed for the survival of first instar *H. angustipennis* larvae exposed to copper (fig. 2). Copper toxicity increased strongly with increasing exposure time. The 168h LC50 is 11 times lower than the 48h LC50 (fig. 3). Maximum measured copper concentrations in the rivers Rhine and Meuse do, however, not have acute lethal effects on first instar larvae (fig. 3).



## RESULTS

### behaviour

In the behavioural test, no mortality was observed at the highest concentration tested (325 µg/L). However, larvae stop ventilating at low concentrations of copper (EC50 16.8 µg/L). Increasing copper concentrations increases inactivity and after an initial increase in "other activities" at low copper concentrations, this behaviour decreases dramatically at higher concentrations (fig. 4). Maximum copper concentrations in the rivers Rhine and Meuse exceed the EC50 for behaviour (fig. 3).



## CONCLUSIONS

- Copper toxicity to first instar larvae increased strongly with increasing exposure time (fig. 2).
- Behavioural responses of fifth instar larvae exposed to copper occur at much lower concentrations than lethal effects on first instars, making the impedance converter a sensitive device for effect monitoring.
- Copper concentrations in large European rivers have no acute lethal effect on first instar larvae (fig. 4).
- Copper concentrations measured in the rivers Rhine and Meuse often exceed the EC50-value for behaviour (fig. 3). Sublethal effects in the field are therefore likely to occur, therewith probably restricting the distribution of this caddisfly species.