

# An evaluation of sampling methods for emerging insects in freshwater mesocosms



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## Introduction

Mesocosm studies are used as tool for ecotoxicological risk assessment under natural conditions. Caquet et al. (2004 a & b) mentioned, that insect populations did not recover as quickly in net covered mesocosm ponds as in uncovered ponds due to a lack of external recovery. In a new continuative experiment the recovery potential of emerging insects in insecticide treated mesocosms will be examined with tent-like net systems. The use of emergence traps (Fig. 1) reduces the possibility for recovery or cause a decelerated recovery because an emergence trap removes constantly a certain proportion of organisms. The aim of this study was to analyse the comparability of the hatching success using conventional traps and a manual method by collecting pupal exuviae.

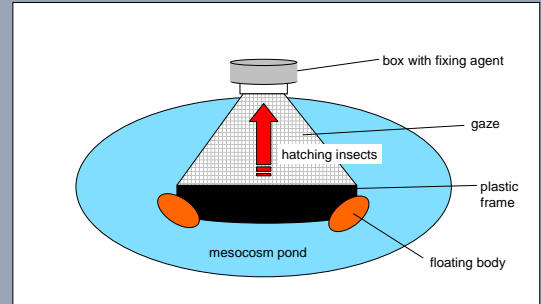


Fig. 1 Schematic diagram of a mesocosm pond with an installed emergence trap

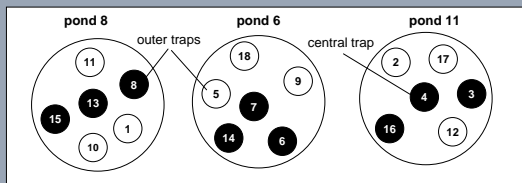


Fig. 2 Schematic diagram from the experimental design of the mesocosms used in the experiment, ● trap with gaze, ○ trap without gaze



Fig. 3 Mesocosm pond with 2 types of emergence traps (with and without gaze)

## Methods

- In each pond six emergence traps were installed:
  - three conventional ones and three traps without gaze (Fig 2 & 3.).
- conventional emergence traps were emptied once a week
- open traps: sampling of pupal exuviae five days per week
- Because of the two missing sample days, the disappearing rate of the pupal exuviae due to microbiological degradation and weather influence (e.g. rain) falls was analysed
- The experiment run for eight weeks.

The emergent insects were divided into six groups:

- Chaoboridae (*Chaoborus crystallinus*)
- Culcidae (*Culex pipiens*)
- tall Chironomidae
- small Chironomidae
- Baetidae (*Cloeon dipterum*)
- other Diptera

## Results and Discussion

⇒ Disappearing rate of the pupal exuvia was not significant, so it was possible to skip one or two sample days

### Influence of the trap design:

- C. crystallinus*, *C. dipterum*, other Diptera: no significant difference
- C. pipiens* and small Chironomidae: significant differences => higher abundance in the inside trap (Fig.4 a).

### Explanation:

- ⇒ *C. pipiens*, which is sensitive to disturbance of the water surface, accumulated under the closed undisturbed traps and hatched there. Nachtigall (1962) mentioned that culicid pupae showed very fast movements and escape after shading the water surface.
- ⇒ Small Chironomidae have small hyaline pupal exuviae, which disappear very fast

### Influence of the trap position :

- ⇒ Pelagic *C. crystallinus*, *C. pipiens* and other Diptera: no significant difference
- ⇒ Chironomidae in general and *Cloeon dipterum*: outer trap with higher abundance (Fig 4 b.)

### Explanation:

- ⇒ The latter organisms graze on surfaces and sediments (Bauernfeind & Humpesch 2001, Wiederholm 1986). The inner wall surface of the mesocosms offers them an adequate habitat. Therefore the probability to hatch within the outer traps is much higher as within the central traps, because of the closeness to the mesocosm wall.

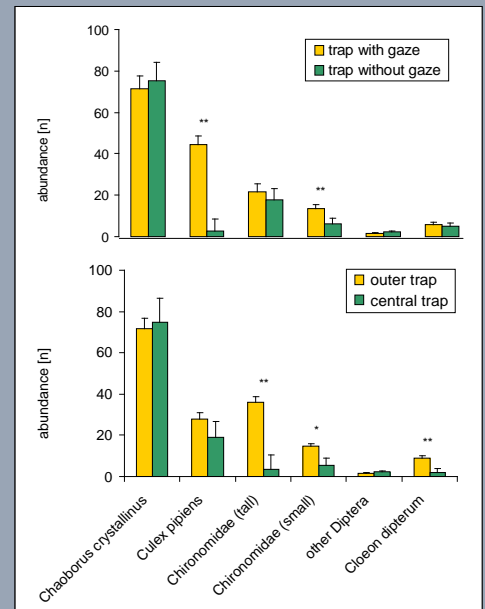


Fig. 4 Experiment with emergence traps a) with or without gaze and b) trap position, mean abundance in one week  $\pm$  Sd (\* =  $p > 0,05$  significant, \*\* =  $p > 0,001$  highly significant)

## Conclusions

- ⇒ In terms of *Chaoborus crystallinus* the method of conventional emergence traps could be validated.
- ⇒ The substitution of emergence traps by a manual sampling of exuviae seems to be possible.
- ⇒ The choice of the ideal sampling method and position of the traps should depend on the concerning question. Important clues could be the life history, the habitat of the organisms and their sensitivity to disturbance.

## Literature

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