Colonisation potential of insects for indoor mesocosms -
Insect emergence from small nearby ponds

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I Background:

The stream and pond mesocosm system (FSA) hosted by the Federal Environment Agency (UBA) in the south of Berlin, Germany is used mainly to examine the effects of substances and microorganisms on the flora and fauna of aquatic systems and their dispersal as well as stability in different aquatic compartments.

The different demands of the experimental design are facilitated by providing both outdoor and indoor systems, the indoor mesocosms offering high controllability in relation to physicochemical parameters. Organisms under investigation are introduced in standardized ways with the aim of creating „identical“ conditions throughout the 8 parallel systems.

However, the adjustment of water temperatures to natural fluctuations during summer (mainly in July and August) requires periodical opening of the building gates. Thus insects may enter the mesocosm hall and thereby influence, in an uncontrolled way, the aquatic community established. This study was conducted in order to get an impression of the dimension of this possible immigration.

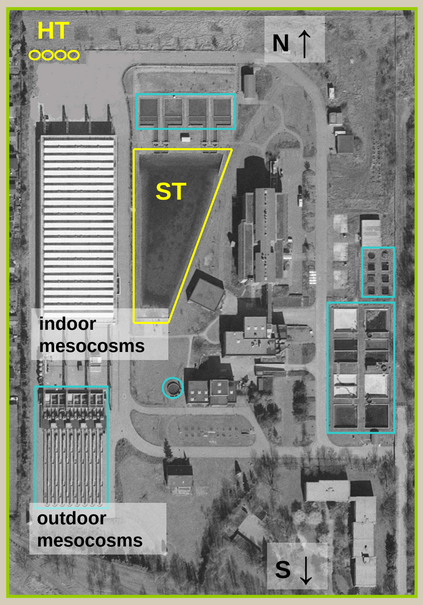

Fig.1. Premises of UBA; open water bodies framed; yellow – ponds under investigation

II Previous work:

In summer 2004, two outdoor streams were used to investigate the natural primary colonization (Jähn 2005). Different habitat structures were sampled and macrozoobenthos organisms recorded at bi-weekly intervals. At the same time, sampling of surface waters within a radius of 15 km of the FSA was conducted in order to identify the groups of insects which could act as potential colonizers of the FSA.

The comparison of these two data sets suggested that most individuals originated from waters within the immediate vicinity of the mesocosms, e.g. the water storage pond next to it (ST in Fig.1).

Based on this finding attention was paid to the following questions:

- **Which** groups of merolimnic insects emerge in close proximity to the mesocosm system and at what rate?
- **What** is the phenology of the ponds over a period of three months?
- **Are** there differences in faunal composition between the ponds examined? Concerning species composition, we focussed on Chironomids which dominated the fauna.

III Methods:

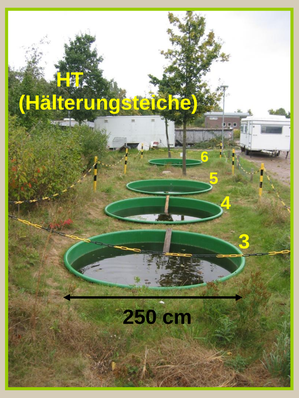

Fig.2. Small ponds for plant cultivation

- Five permanent ponds were investigated from 04/05 to 23/08/06 (Figs.2, 3; Fig.1 - yellow frames).
- One to two emergence traps (Fig.4) were used on smaller ponds (HTs Fig.2), nine on a bigger water storage pond (ST Fig.3) covering a depth gradient.
- Random changes of trap positions were performed every fortnight within a grid of 24 fields (Fig.5).

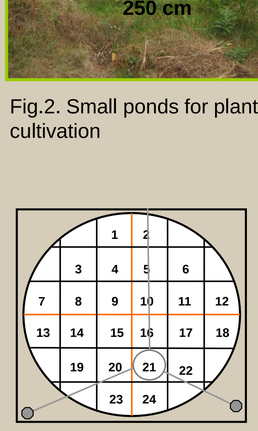

Fig.5. Grid applied on HTs for changing trap positions

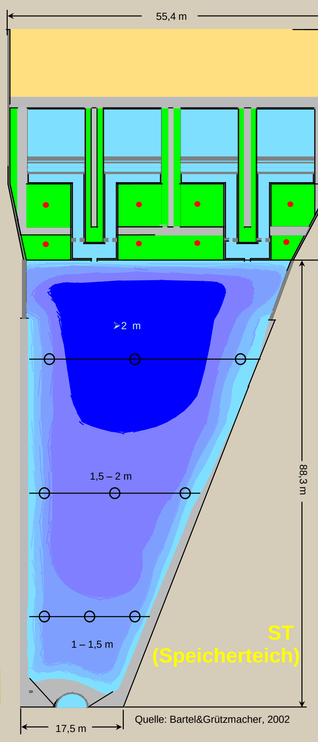

Fig.3. Water storage pond (ST), part of sand filtration system

Fig.4. Floating emergence trap

- ➢ All traps were emptied weekly.
- ➢ Weekly measurements of physicochemical parameters were conducted.
- ➢ Permanent climate data was gathered by the UBA meteorological station.
- ➢ Samples representing 12 weeks were counted and sorted by Order (Ephemeroptera, Trichoptera, Odonata) and Family (Diptera).
- ➢ Constituting the most abundant Family, Chironomidae, samples from every fourth week, were sorted in terms of morphology into putative species groups.
- ➢ Three male Chironomid individuals of each putative species group were determined to genus or species level.

IV Results:

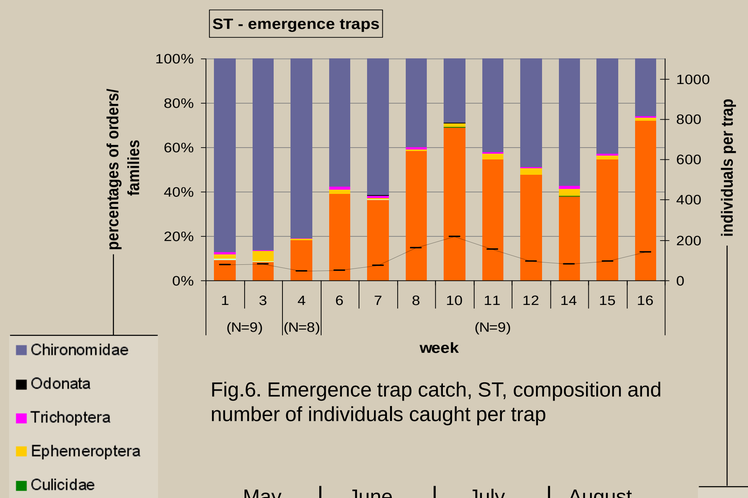

Fig.6. Emergence trap catch, ST, composition and number of individuals caught per trap

Diptera comprised most individuals of the catch of more than 24,300 insects examined.

Ephemeroptera, Trichoptera and Odonata generally amounted to less than five percent of the total catch.

Chironomidae and Ceratopogonidae made up almost all individuals caught in ST (Fig.6), whilst HTs mainly hosted Chironomids (Fig.7).

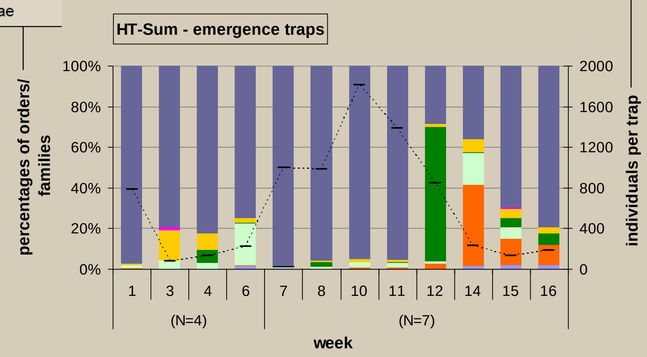

Fig.7. Emergence trap catch, HT catches pooled, composition and number of individuals caught per trap

In contrast to ST, HTs showed erratic emergence of certain groups (e. g. mass emergence of Culicidae).

However, insects from both pond types had emergence peaks around the beginning of July (weeks 8 to11).

Tab.1. Chironomid genera/ species identified, sorted by source water

genera/ species	ST	HT3	HT4	HT5	HT6
Ablabesmyia phatta	x			x	
Chironomus tentans	x				
Chironomus dorsalis	x	x	x		
Chironomus riparius	x	x	x		
Chironomus (Lobochironomus) spec.	x	x	x		x
Corynoneura carriana	x	x	x	x	x
Cricotopus (Cricotopus) spec.	x				
Cricotopus sylvestris	x	x	x	x	x
Glyptotendipes glaucus		x			
Labrundinia longipalpis	x				
Monopelopia tenuicalcar	x	x		x	x
Paratanytarsus spec.		x			
Paratrichocladius spec.	x				
Polypedilum (Pentapedilum) sp.	x	x			
Polypedilum (Polypedilum) sp.			x		
Procladius sagittalis	x		x	x	x
Psectrocladius obvius	x				
Psectrocladius platypus	x				
Psectrocladius (Psectrocladius) spec.	x	x	x	x	x
Indet.-sum	x	x	x		x

All together, 19 species could be identified. Of these 16 originated from ST while the HTs constituted 10 and fewer species each (Tab.1).

Ponds differed with regard to the level of insect Order and Family (Figs. 6, 7) as well as in the species composition of Chironomids (Tab.1).

Further studies are necessary to examine which of the insects detected actually enter the mesocosm hall and which factors influence their egg laying.

A high number of possible insect colonisers emerged from ponds nearby the indoor mesocosm system. Their identity and abundances differed between ponds and over time, with insect emergence peaking in July. Further studies need to focus on factors influencing their possible entering and egg laying.

Literature: Jähn, K. (2005): Untersuchungen zur Primärbesiedlung künstlicher Fließgewässer-Mesokosmen und gezielte Ansiedlung ausgewählter Makroinvertebraten, Diplomarbeit, Universität Potsdam
Bartel, H./ Grützmacher, G. (2002): Elimination of Microcystins by Slow Sand Filtration at the UBA experimental field, Riverbank Filtration, Dodrecht, pp123-133

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