

Biological filtration of treated waste water by Daphnia

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Antwerp, Belgium

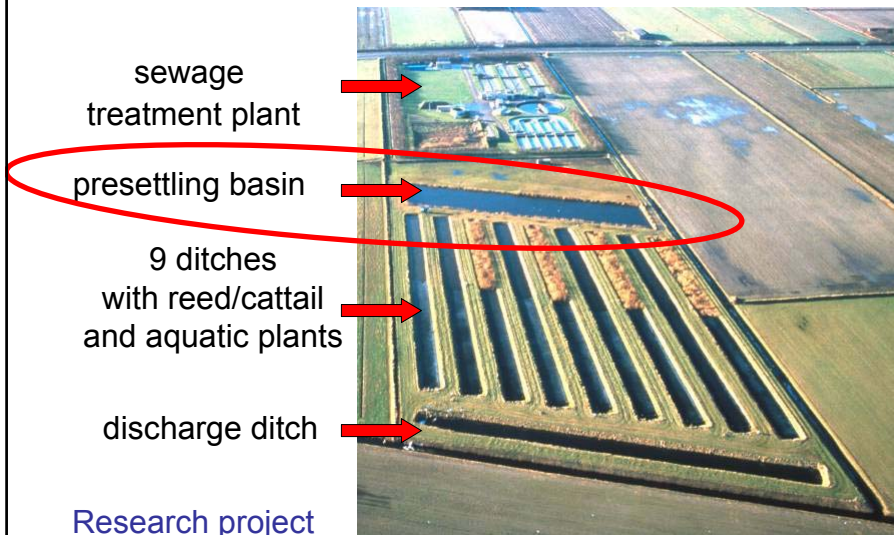
With Harm van der Geest, Lluís Sala, Anna Romani, Joaquim Comas, Theo Claassen, Sybren Gerbens, Rennie Neef, Wilbert Menkveld



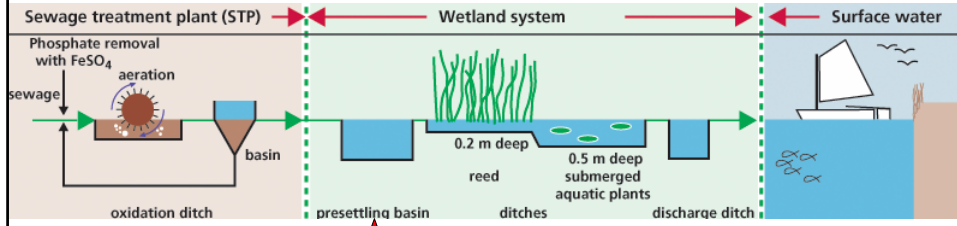
This research project is part of PhD study of Ruud Kampf: experiments 2007 - 2008



STP Eversteekoog



Biological filtration by Daphnia



Focus on ponds fed by well treated effluent from activated sludge plants



www.waterharmonica.nl



Empuriabrava

Daphnia



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Daphnia – “engineering”



- Length: 0.3 - 5 mm
- Wet weight: 0.5 - 2 mg
- Filtration capability: 2 - 4 ml/ind.hour
(1000 Daphnia/l filtrates water 2 - 4 times per hour)
- Size of food particles between 1 - 40 μm



Protein: 60 %
Fat 10 %
Carbohydrates 6 %

C = 44 %
N = 8 %
P = 1.4 %

Daphnia food chains



Empuriabrava



Grou



Eversteekoog



Everstekoog

Ponds and Mesocosms

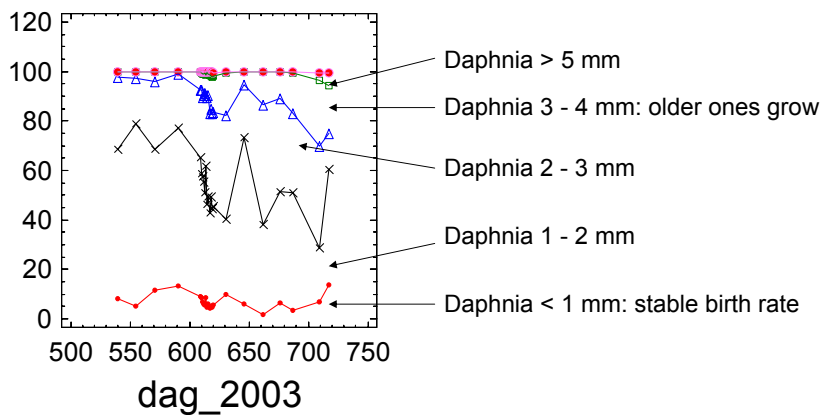
from 1998 - 2006



Daphnia size distribution

new digital counting method

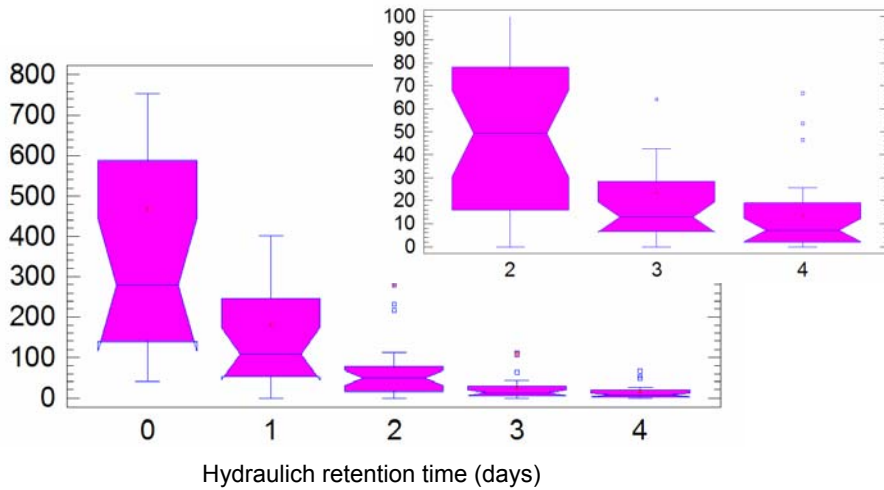
Size of Daphnia (mm)



Feacal Coli removal

(nr / ml)

temperature < 10 °C



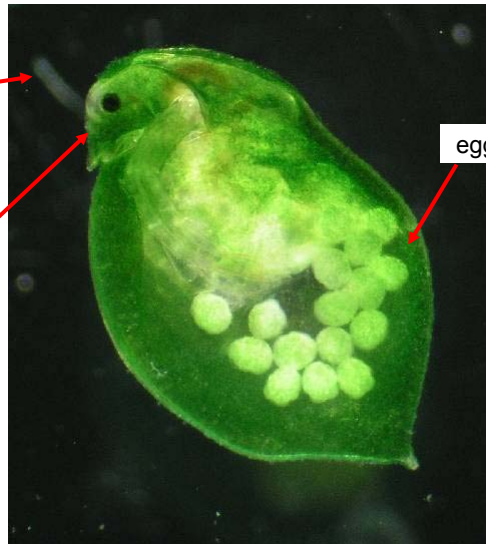
28 – 2 – 2006

winter *Daphnia magna*, overgrown with algae, temp +2°C

antenna



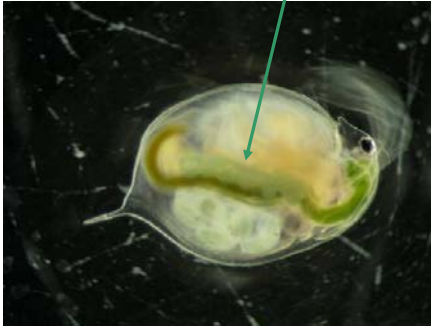
eye



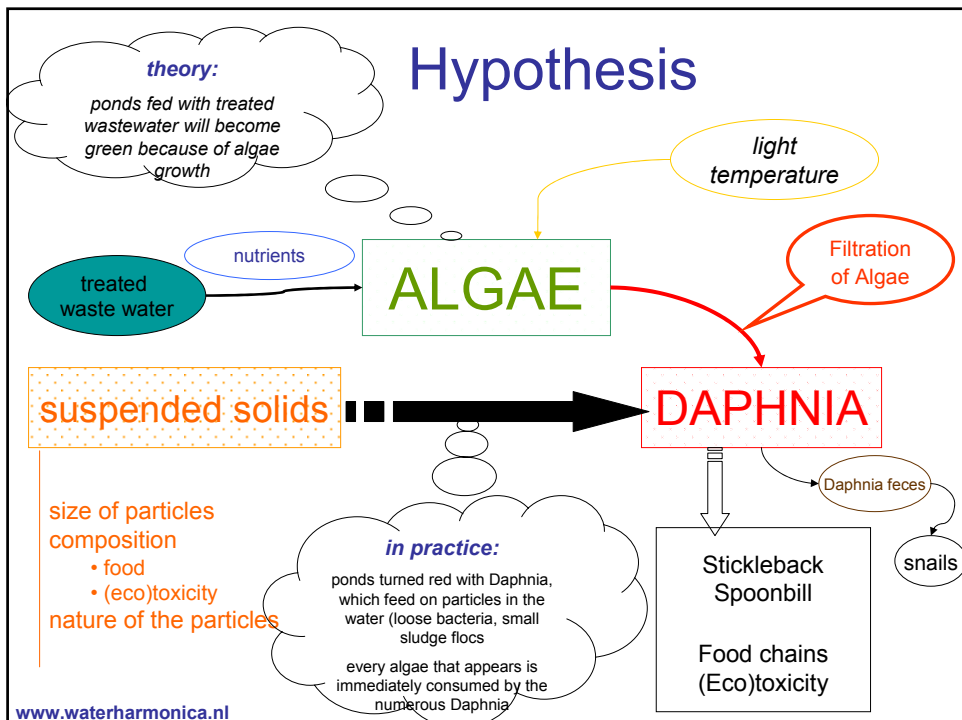
eggs

What do the Daphnia eat?

Algae or/and Sludge ??



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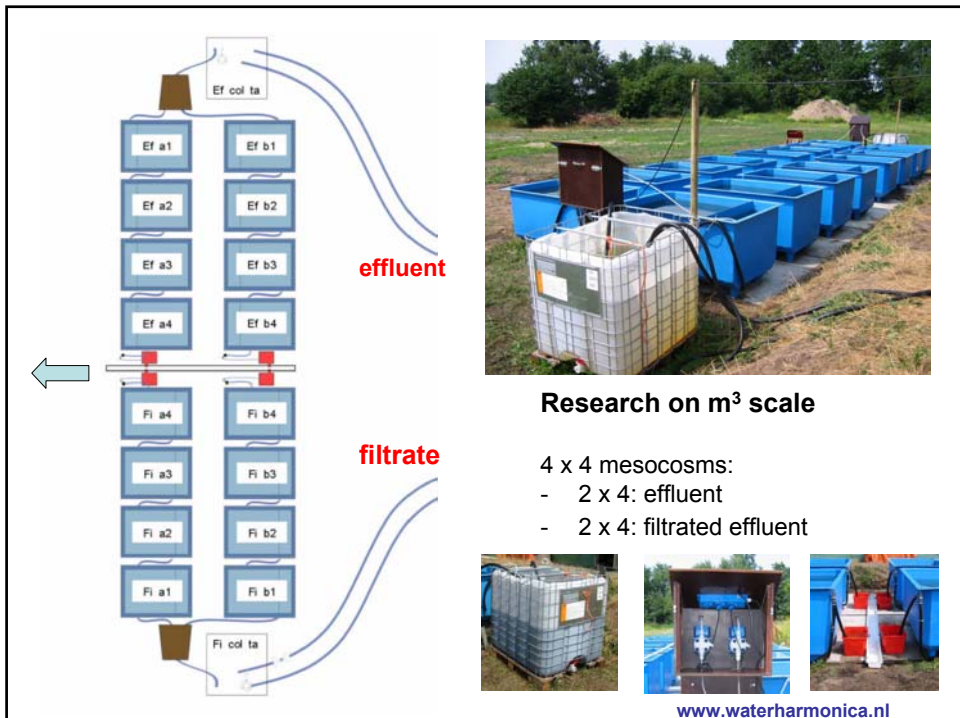
Horstermeer
experiments in effluent upgrading
2005 – 2008



Biological
filtration

Technical
filtration

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Equal experiments on three STP's



Horstermeer
Netherlands

Effluent
Filtrated effluent



Grou
Netherlands

Parallel to ponds

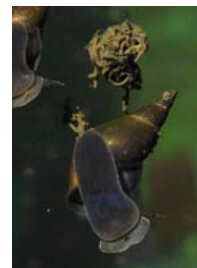


Empuriabrava
Spain

Parallel to ponds



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Not only Daphnia:

Suspended material and benthic algae:

- biological filtration by Daphnia
 - mainly *Daphnia magna*, but also other Cladocera

Attached algae and settled sludge:

- grazing by snails
 - Holland: mainly Great pond snail *Lymnaea stagnalis*



Mesocosms Horstermeer, autumn 2007

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Biological filtration of treated wastewater by Daphnia: An alternative for technical filtration, or an addition?

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 Udo Sahl, *Institute for Water Resources, University of Applied Sciences, Hochschule Niederrhein, Environmental Engineering, Institute of Environmental Technology, 47524 Xanten, Germany*
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 Joseph Carlini, *Institute for Water Resources, University of Applied Sciences, Hochschule Niederrhein, Environmental Engineering, Institute of Environmental Technology, 47524 Xanten, Germany*



Three Cleanest, innovative water treatment technologies:
 Robert Carlini, *Institute for Water Resources, University of Applied Sciences, Hochschule Niederrhein, Environmental Engineering, Institute of Environmental Technology, 47524 Xanten, Germany*
 Robert Carlini, *Institute for Water Resources, University of Applied Sciences, Hochschule Niederrhein, Environmental Engineering, Institute of Environmental Technology, 47524 Xanten, Germany*
 Robert Carlini, *Institute for Water Resources, University of Applied Sciences, Hochschule Niederrhein, Environmental Engineering, Institute of Environmental Technology, 47524 Xanten, Germany*

Constructed wetlands convert treated wastewater into usable surface water with abundance of "natural life"



Three Milestones, Realization, Goal and Expectations



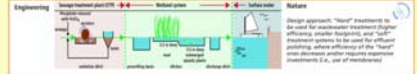
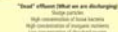
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TROPIC WEBS FROM DISCHARGES: NATURE ENHANCEMENT THROUGH THE WATERHARMONICA CONCEPT

July 11, 2008, R. Kumpf, U. Sahl, J. Carlini, and R. van der Meer

The Waterharmonica concept: initial approach

- Remove suspended matter and "load" effluent with oxygen on the receiving water body
- Treat to meet "load" effluent to the wastewater treatment plant (wastewater treatment plant)
- Discharge to natural water body (river, lake, sea, etc.)
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Upgraded treated water can be environmental protection



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SC18

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SC19