

WATER PURIFICATION PERFORMANCES OF FRESHWATER MUSSELS



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Introduction: Fresh water bivalves provide important ecosystem services due to their feeding habits. The following trials intend to demonstrate the potential impact of fresh water mussels on their environment. The first results presented here, should also help to develop further experiments to prove ecosystem services provided by freshwater mussels and their impact on water chemistry and fish condition.

Methods:

Trial A consisted of 2 identical tanks installed outside, both supplied with well water that was retained in a small pond for several days, in order to allow a natural algae growth. The water was pumped through both tanks and the pond in a recirculating manner.

Approximately 30 % of the water in the pond was replaced by fresh well water daily. The tanks were stocked with 80 brown trout (*Salmo trutta fario*) each. The average weight was 31 g/fish.

The flow rate in both tanks was 0,1 l/s, which leads to a retention time of 10 seconds for one litre of water.

Both tanks contained a 3 cm thick layer of gravel. Tank A contained 10 Swan mussels (*Anadonta cygnea*). Tank B didn't contain any mussels.



Trial B consisted of 2 identical troughs, both supplied with river water in a permanent flow-through.

The flow rate in both troughs was 0,08 l/s, which leads to a retention time of 12 seconds for one litre of water.

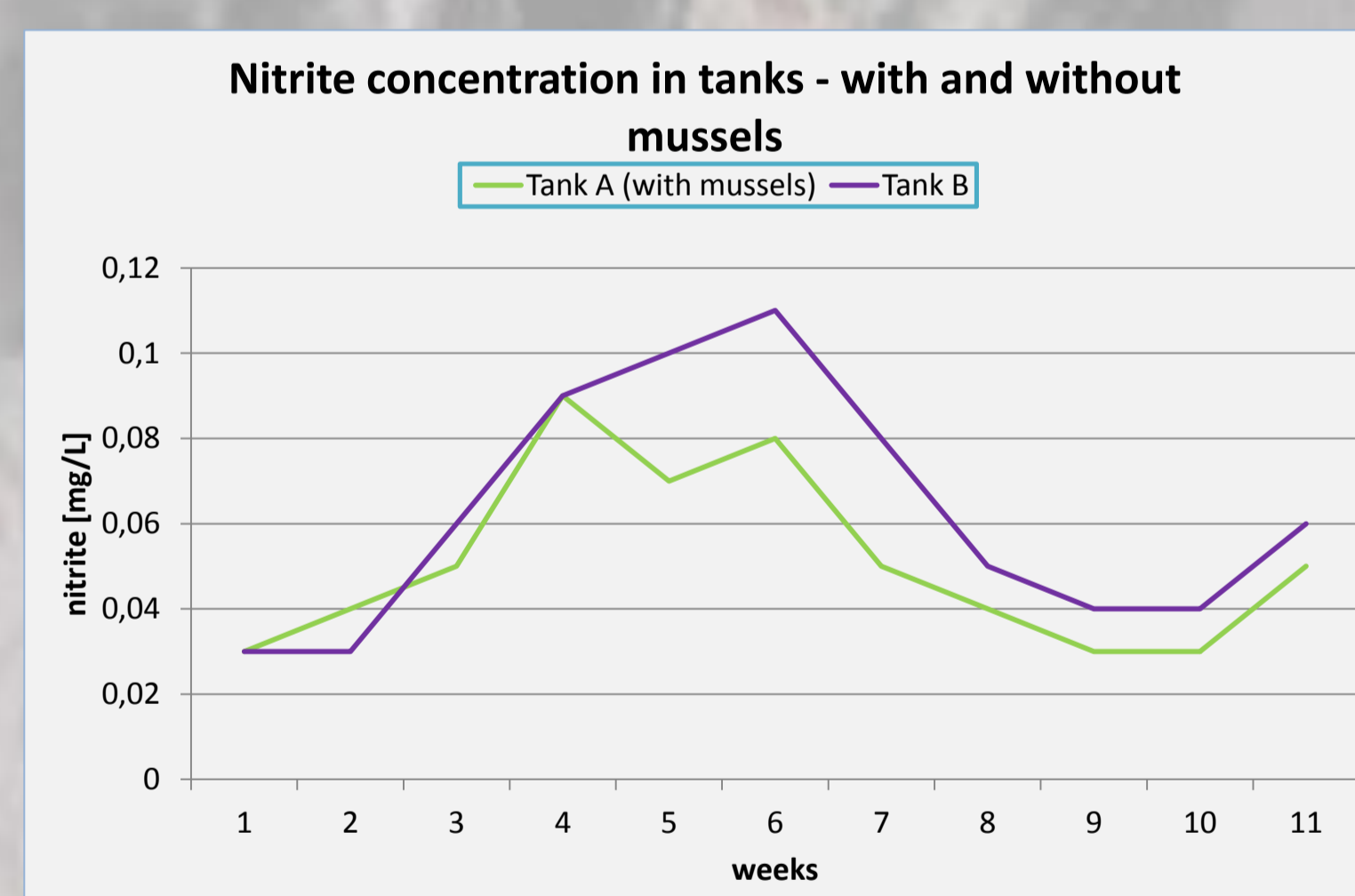
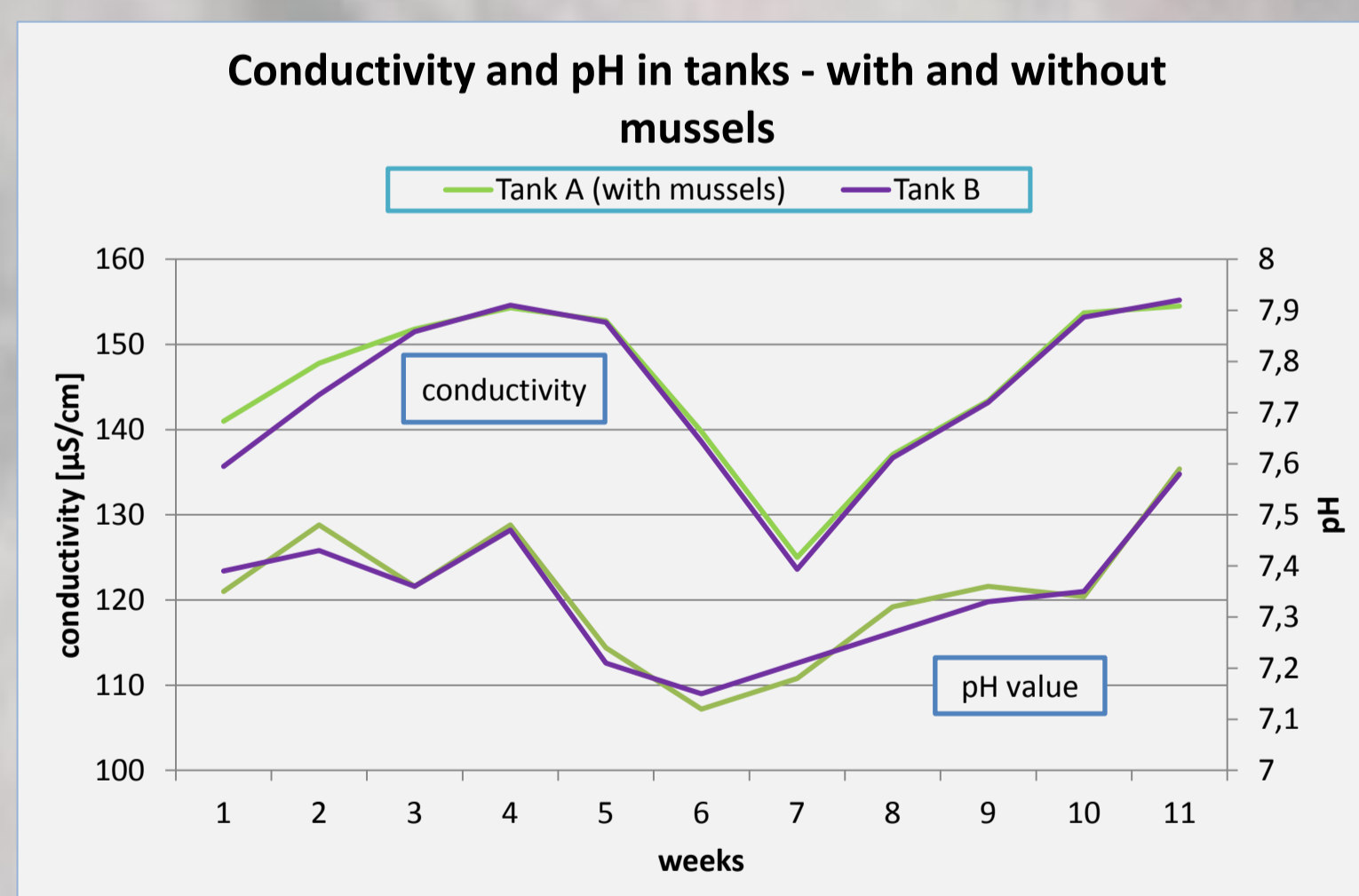
8 baskets filled with gravel were placed in each trough, those in trough A contained 85 adult thick shelled river mussels (*Unio crassus*). Trough B didn't contain any mussels.



The following parameters were determined once weekly for all tanks, the well- and river water: temperature (° C), oxygen (mg/l), conductivity (µS/cm), turbidity (FNU), pH, NO₂⁻ (mg/l), NO₃⁻ (mg/l), NH₄⁺ (mg/l) and PO₄³⁻ (mg/l).

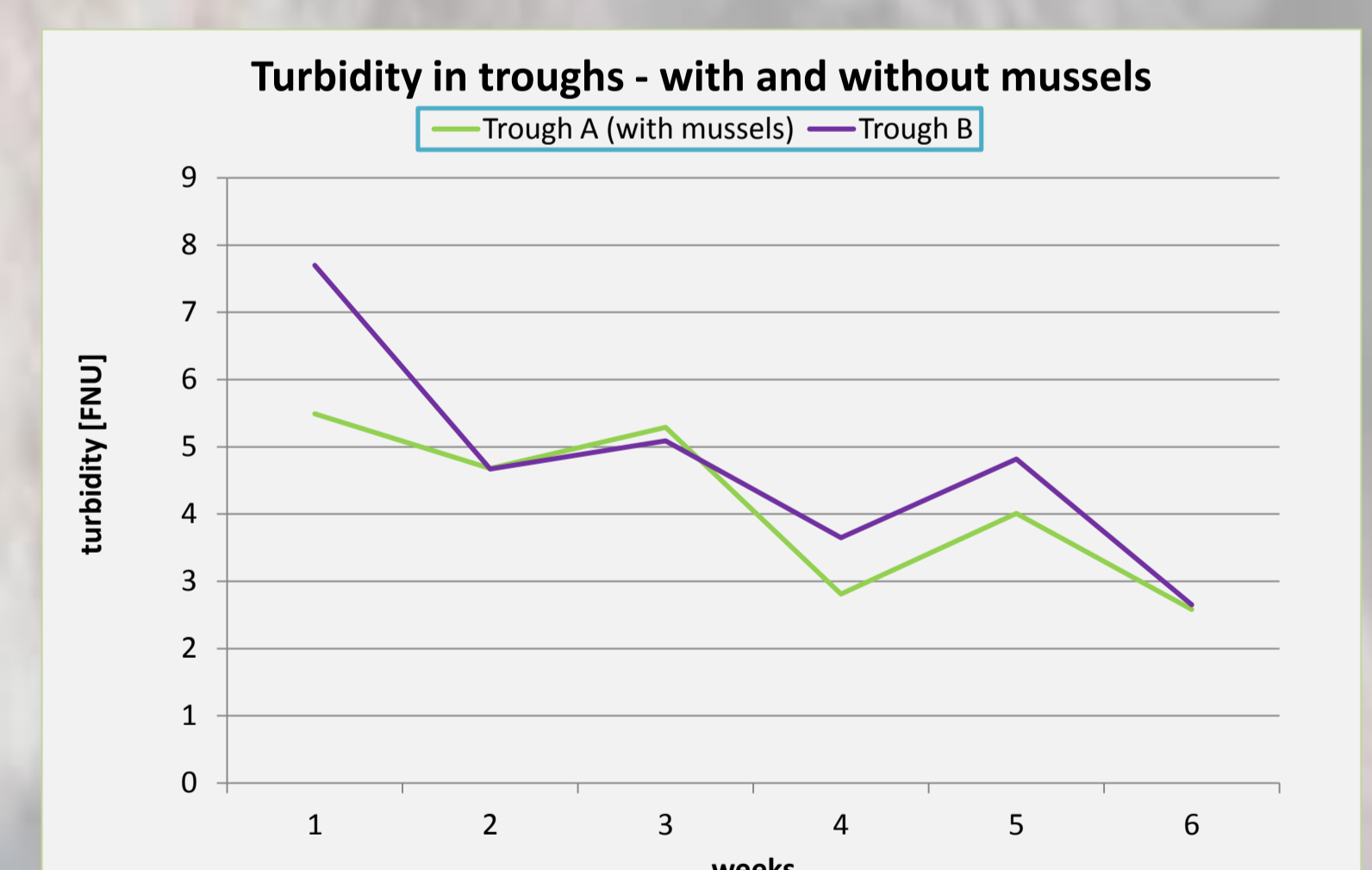
Results trial A:

- Chemical analyses showed a decline of NO₂⁻ and NH₄⁺ (data not shown) in the tank containing mussels. The mussels had no effect on the conductivity and pH value.
- The trial didn't show any significant changes in the behaviour or the condition of the fish in neither one of the tanks.



Results trial B:

- The analyses showed a decline of the turbidity as well as the oxygen level (data not shown) in the trough with mussels.
- The trial was too short for further exact statements on chemical analyses.



Conclusion:

- Fresh water mussels are able to change water parameters. It's worth running further detailed experiments to prove this potential.
- Fresh water mussels are, due to their filtering capacity, able to remove small particles and can hence reduce the turbidity. Also different stages of microparasites, e.g. *Ichthyophthirius multifiliis* could maybe be removed from the water in this manner and help improve fish health. Further trials should be run to prove this presumption.

Outlook:

The setup of trial A needs to be changed for future trials:

- The fish used for future trials need to be of the exact same origin, size and health condition for both tanks.
- The tanks should be placed inside, to prevent them from heating by direct sunlight.
- Both tanks should not drain back into the same pond, but need to be run in 2 separated recirculating systems. 30 % of the water should be replaced daily by water retained in the outside pond, to keep a certain level of natural algae in order to sustain the mussels in perfect condition.
- Anadonta anatina* should be used instead of *Anadonta cygnea*, since it can be assumed that they perform better under the conditions found on the trial site.
- Instead of a complete layer of gravel, 10 baskets should be filled with the exact same amount of gravel and placed in both tanks. Each basket should contain 10 *Anadonta anatina* in one of both tanks.

This setup should lead to more accurate results for both, the influence of fresh water mussels on water chemistry as well as their influence on fish behaviour and health.



Project partners:



LE GOUVERNEMENT DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de l'Intérieur et à la Grande Région



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