

Chironomidae larvae role in nutrient cycling in freshwater ecosystems

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Introduction

The strong impact of the non-biting midge larvae bioturbation on the nutrients and oxygen cycling in the lacustrine sediments was shown more than 40 years ago. Chironomids, thus, has been defined as ecosystem engineers. Ecosystem engineers are defined as organisms, which are changing the availability of resources, for other species by causing changes in the biotic and abiotic environment and in doing so they are creating/maintaining habitats for other organisms. Bioturbation is commonly defined as transport processes carried out by animals that directly or indirectly affect sediment matrices.

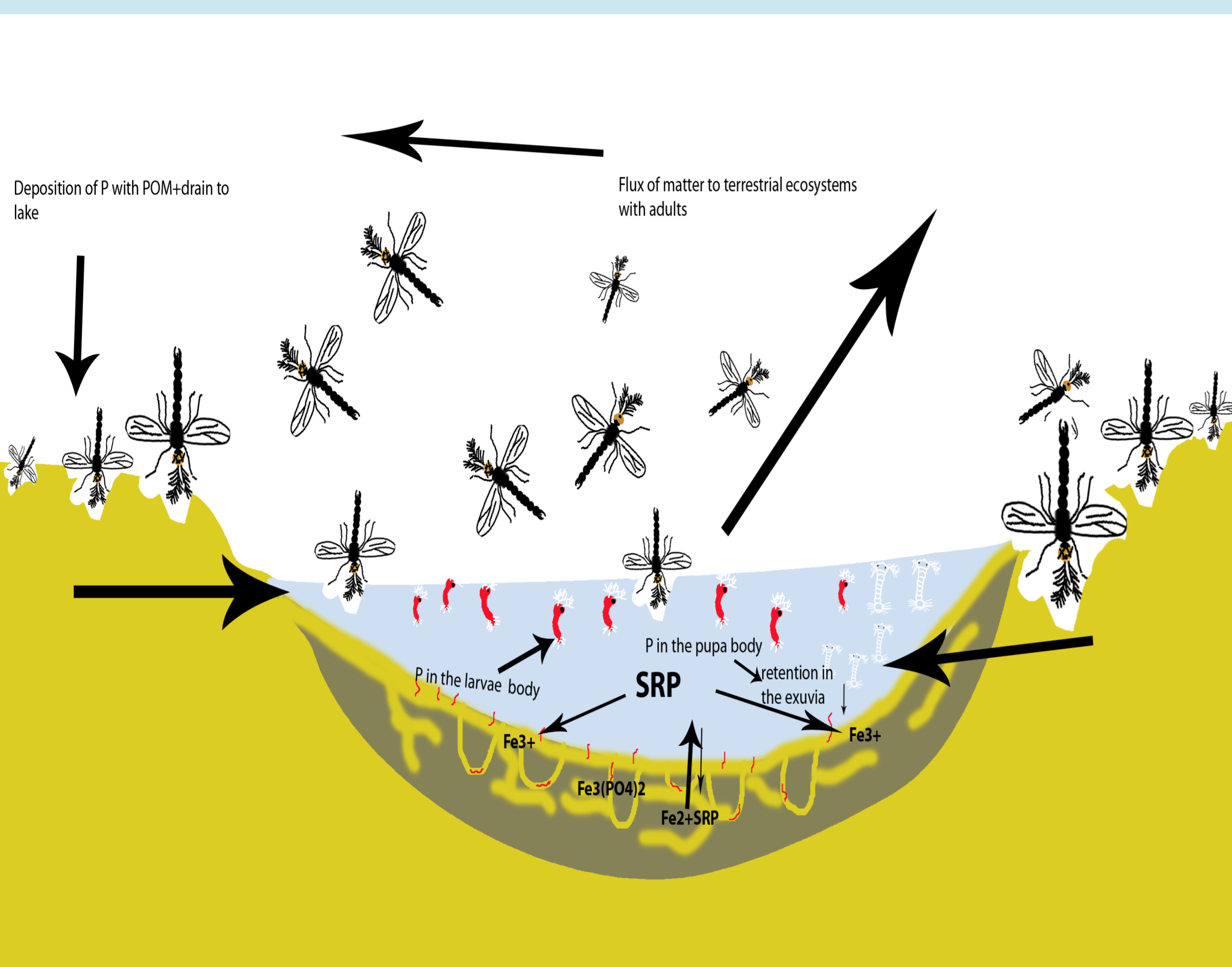
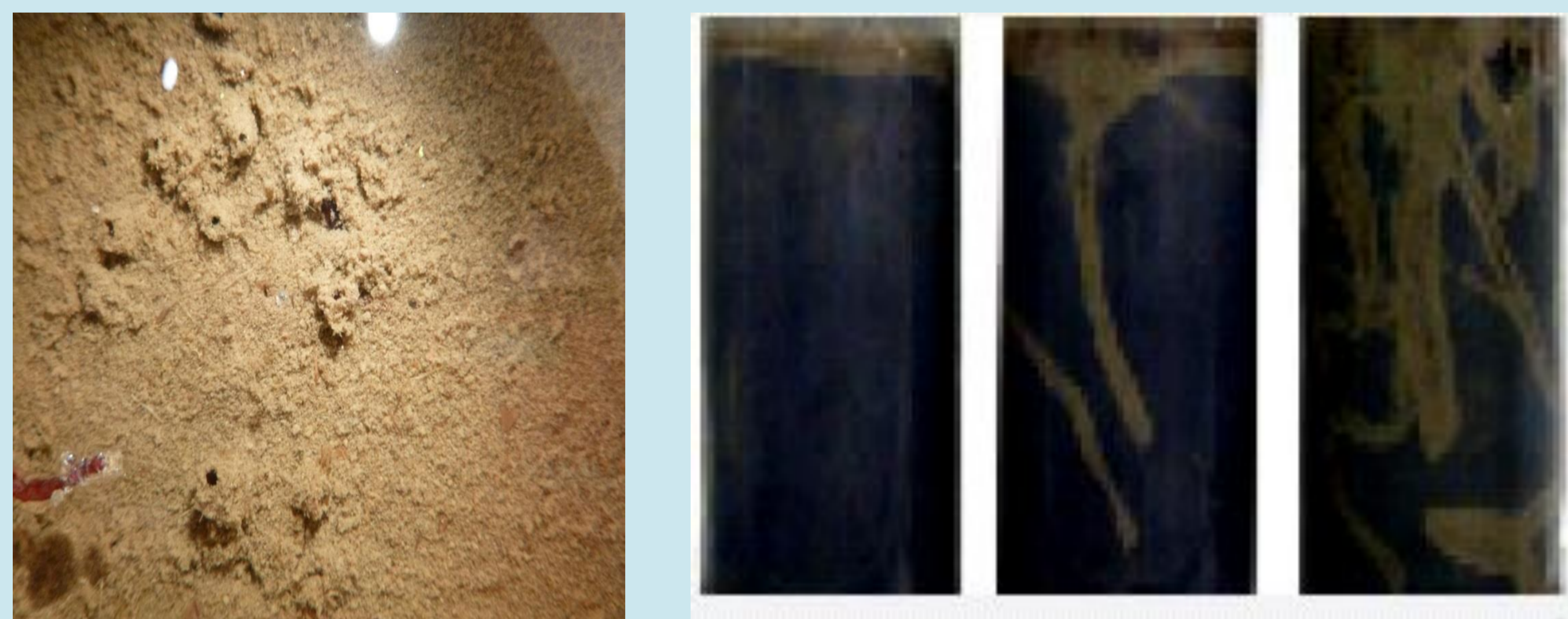


Fig.1. Chironomidae as ecosystem engineers – role in phosphorous cycling in the shallow lake

Aims and scopes

Main aim of this work is review previous studies of the effects of bioturbation and related activities of the widely distributed benthic chironomid species *Chironomus plumosus* (L., 1758) on the shallow lake ecosystem. We are also going to outline future research directions and test validity of some novel techniques for freshwater bioturbation studies.



a

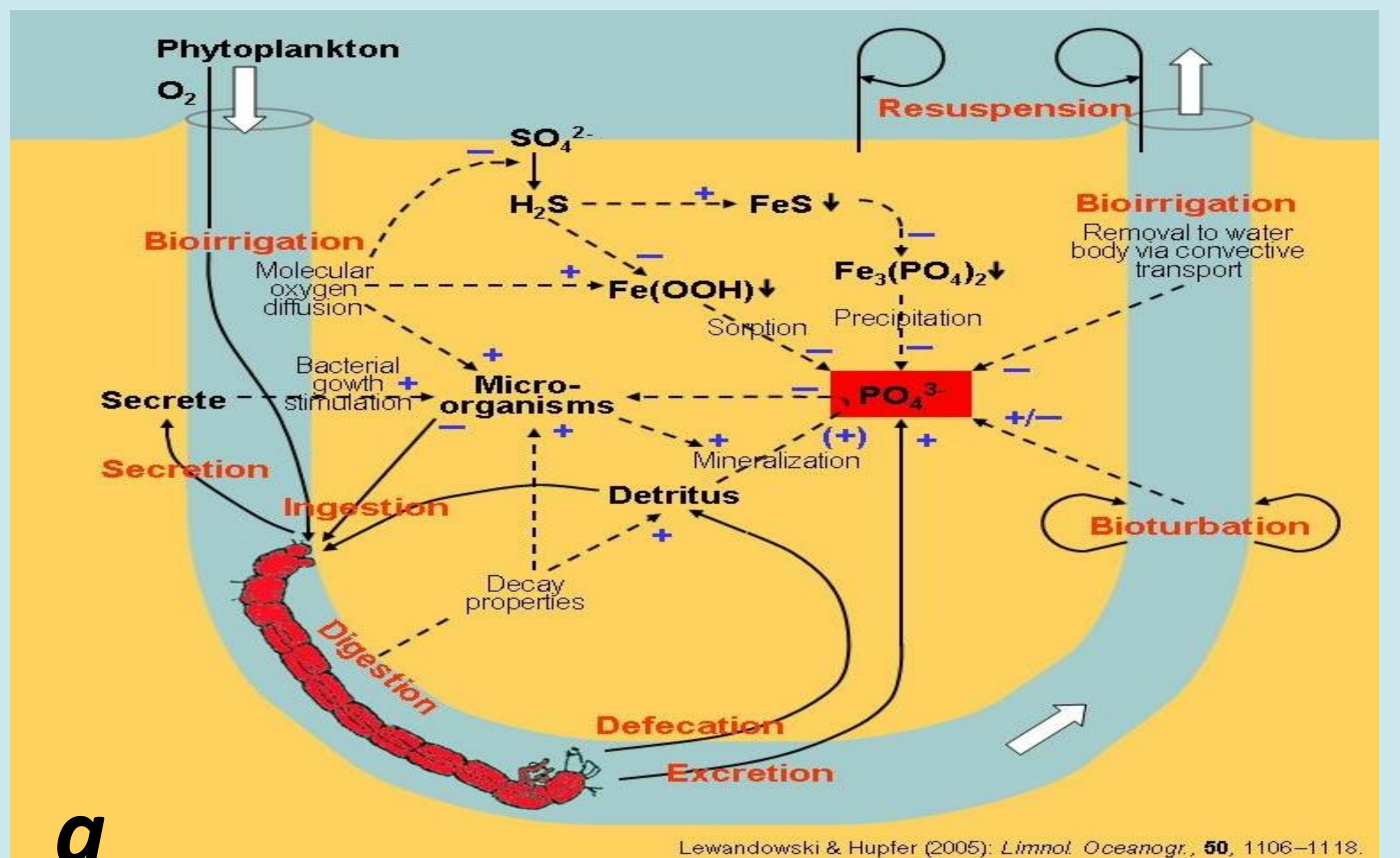
b

Fig.2. Chironomidae bioturbation : a) surface view; b) side view in the mesocosms

Acknowledgments

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Results



a

Lewandowski & Hupfer (2005): *Limnol. Oceanogr.*, **50**, 1106–1118.

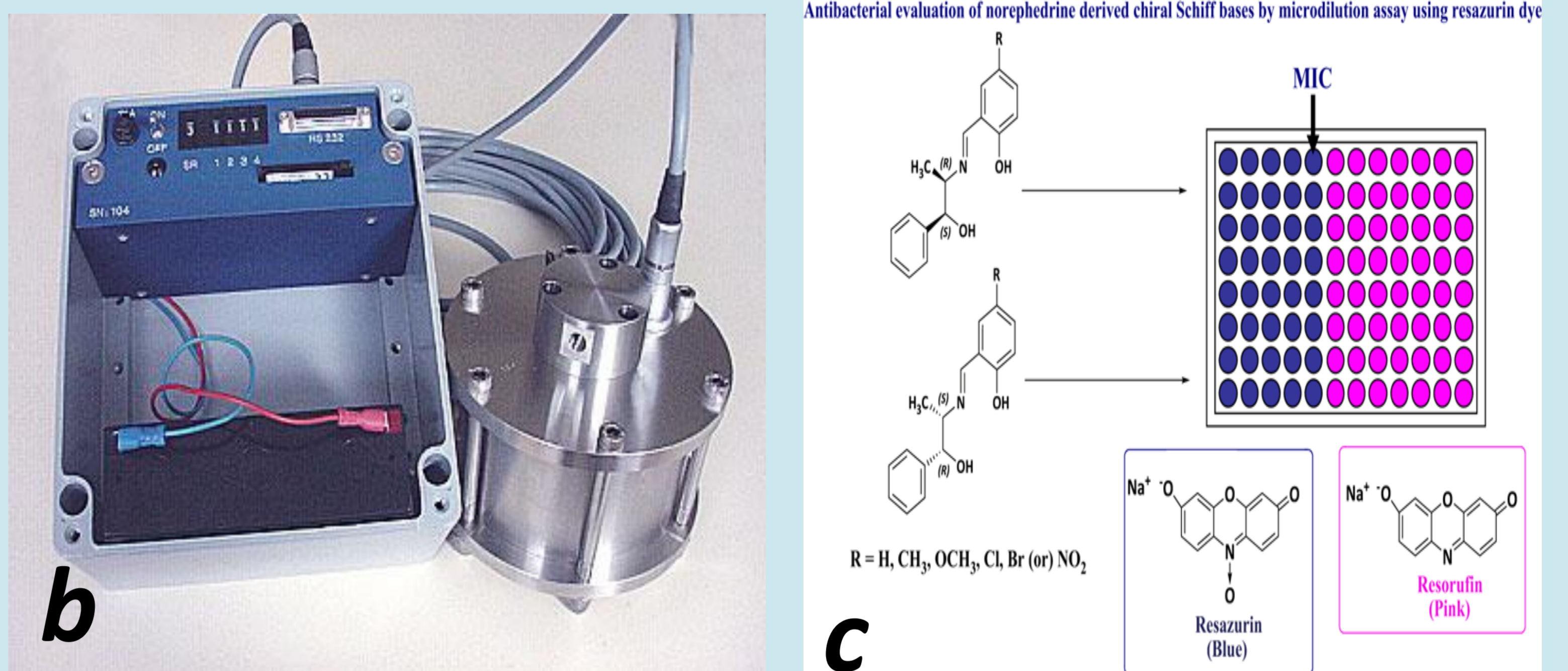


Fig.3. Concepts and methods applied for chironomidae bioturbation studies: a) Conceptual model of bioturbation effects; b) in situ fluorometer; c) Resazurin decay

Influence of chironomidae respiration on sediment metabolism: validation of the novel method

Our first attempts to apply “smart” hydrological tracers - Resazurin, and in situ fluorimeters to studies of the chironomidae bioturbation brought some light on influence of midges bioturbation on the sediment metabolism. Decay of the Resazurin to Resorufin, which has linear dependency on the aerobic metabolism rate, has increase up to threefold in presence of the actively bioturbating larvae. Larval densities from 214 specimens /m² was promoting aerobic sediments metabolism, and lead to complete decay of the Resazurin in the mesocosm at the 3d day of experiment, in contrast to that, in control mesocosms at 7th day of experiment concentration of Resazurin still was about 30% of initial concentration.

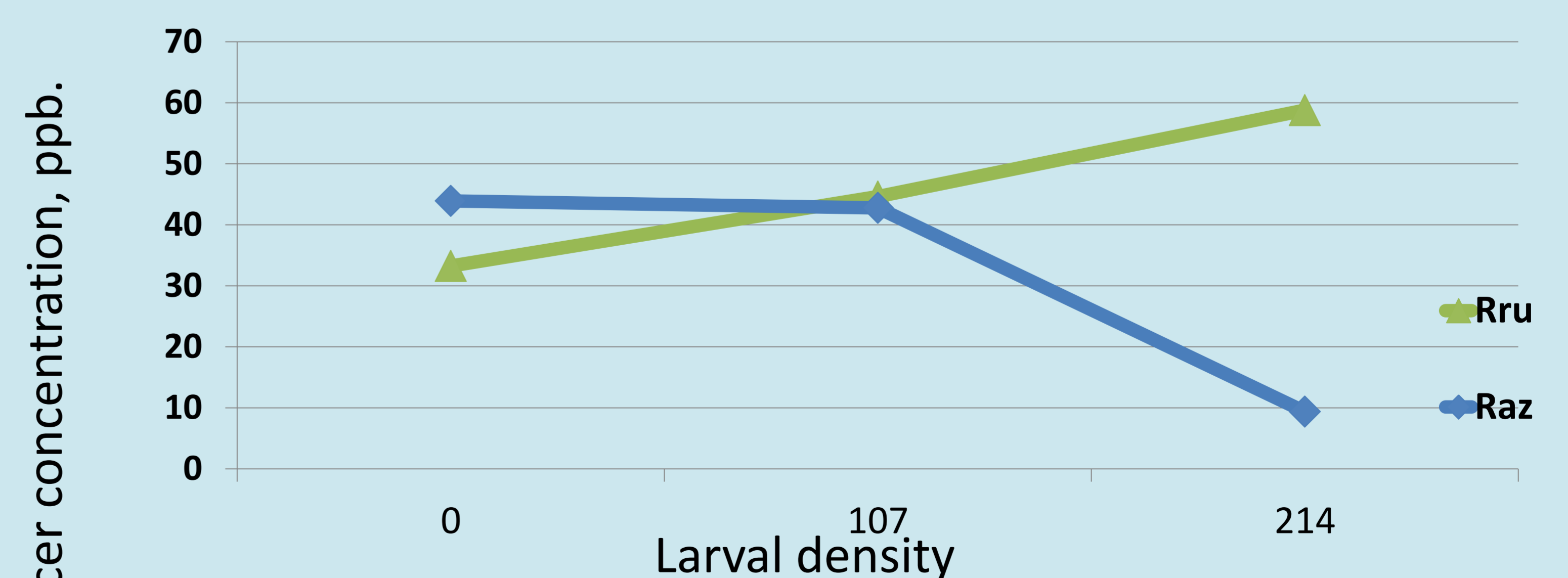


Fig. 4. Resazurin decay rate at different larval densities

Conclusion

Chironomidae as ecosystem engineers are playing crucial role in shaping of the nutrient fluxes and oxygen in lowland lakes, particular aspects of this engineering activity deserve a lot of attention in future.