ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG

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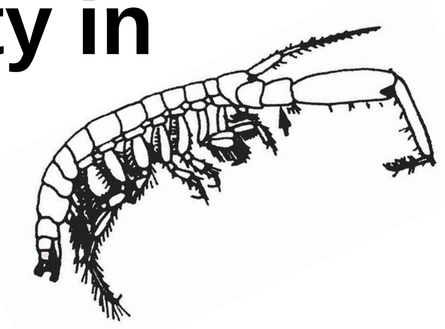
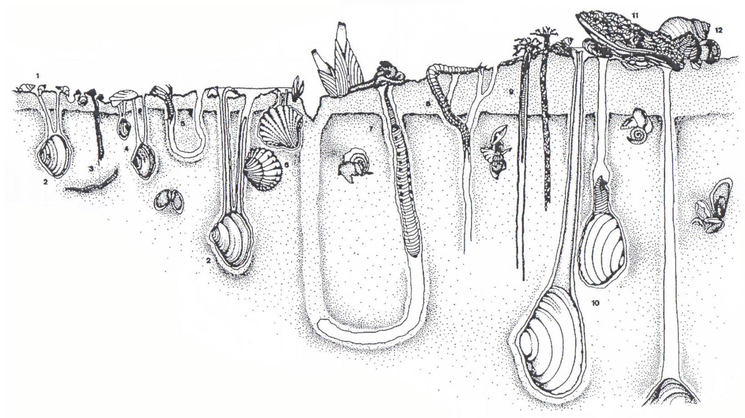
Temperature dependency of bioturbation activity in *Corophium volutator* (Crustacea, Amphipoda)



Introduction

Bioturbators actively modify the structure and porosity of sediments, redistribute oxygen and promote remineralisation, resuspension and burial of organic matter. In the light of globally rising seawater temperatures the aim of this study was to investigate the effect of temperature on the sediment reworking activity of the burrowing amphipod *Corophium volutator* in the North Sea.



Hypothesis

Bioturbation of *C. volutator* will increase with temperature in the range from 10 to 20°C

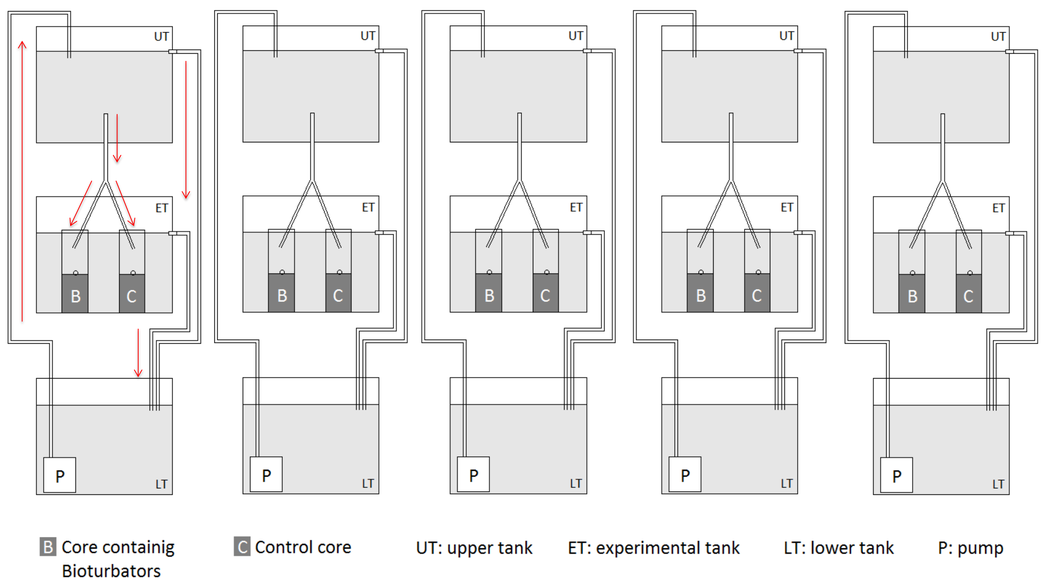


Fig.1: Setup of the replicated water circulatory system to determine bioturbation activity in *C. volutator*. Arrows in left system indicate the water flow direction through the systems.

Material & Methods

- Luminophore tracer technique in sediment cores (diameter: 10 cm; height: 8 cm)
- Densities: 35 ind. / core (collected: tidal flat in the Weser estuary)
- Duration: 7 days
- 2 sets of experiments: “winter experiment” at 10 and 20°C and “spring experiment” at 15 and 20°C
- Bioturbation coefficients calculated using a 1-dimensional diffusion model (Crank, 1975)

Results

- *C. volutator* redistributed luminophores from the surface into deeper sediment layers (Fig. 3)
- Bioturbation activity of *C. volutator* was independent of temperature in the selected range (Fig. 4)
- Body size of the amphipods varied seasonally (Fig. 5)

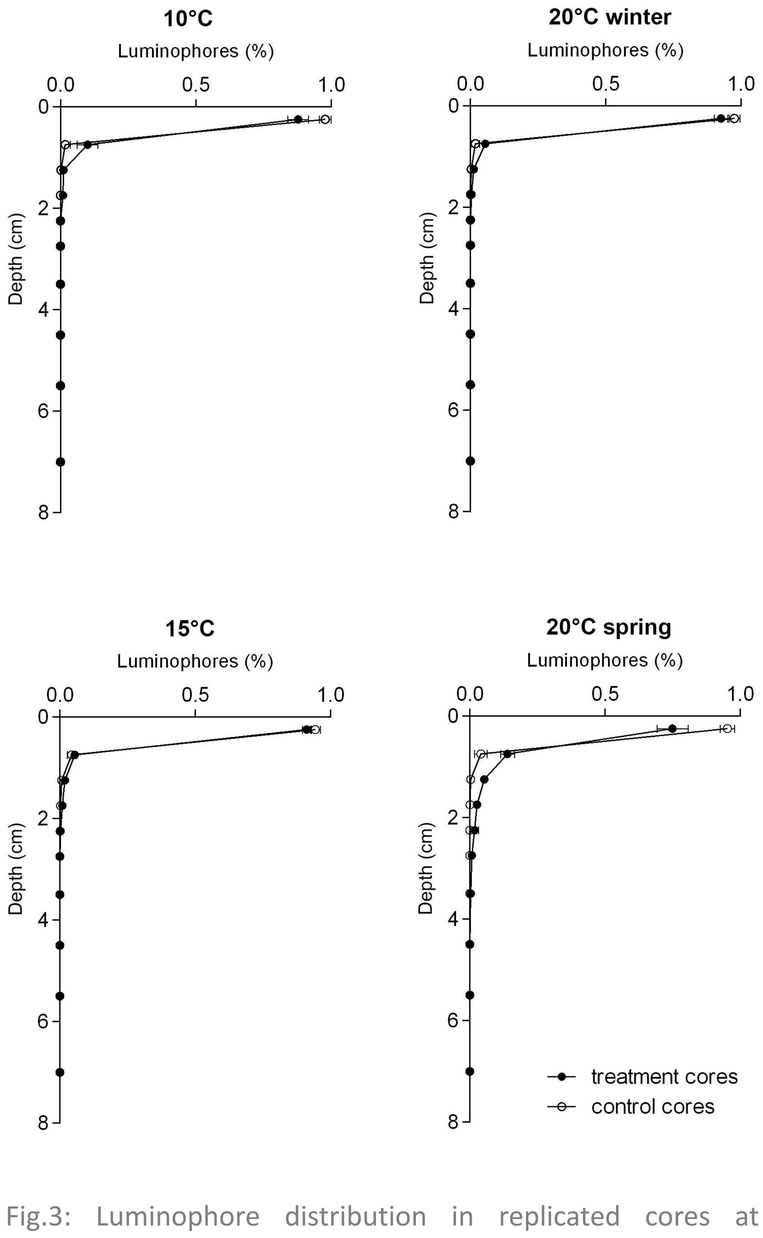


Fig.3: Luminophore distribution in replicated cores at different temperatures: 10 and 20°C (“winter experiment”) and 15 and 20°C (“spring experiment”) in the presence and absence (Control) of *C. volutator*

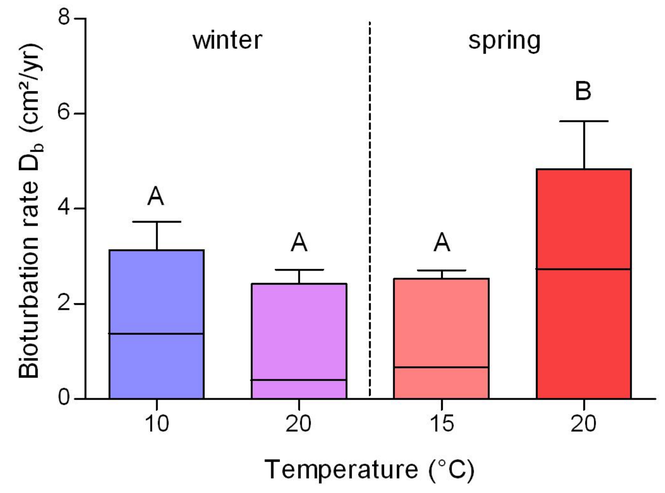


Fig.4: Bioturbation coefficient D_b (mean and SD) at different temperatures: 10 and 20°C (“winter experiment”) and 15 and 20°C (“summer experiment”). Different letters indicate significant differences ($p < 0.05$). Horizontal lines in bars indicate control corrected bioturbation rates.

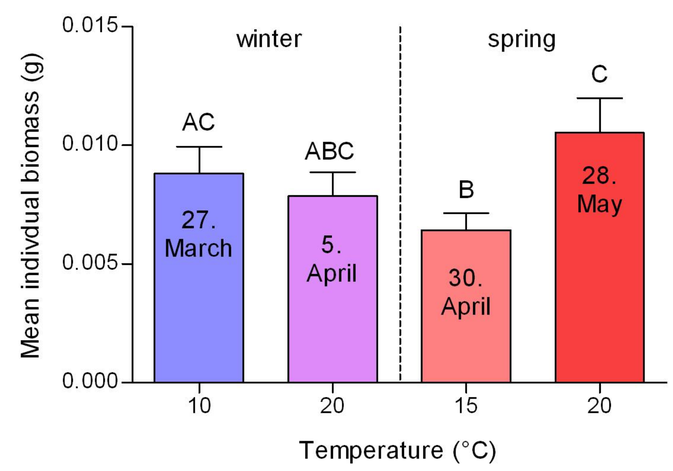


Fig.5: Mean individual wet body mass (mean and SD) of *C. volutator* at the termination (dates inside bars) of the experiments. Letters indicate significant differences ($p < 0.05$).

Discussion & Conclusion

Temperature in the selected range had no direct effect on bioturbation rates of *C. volutator*, whereas sediment reworking activity varied substantially with individual body mass.
Timing of recruitment and growth of *C. volutator* is controlled by ambient temperatures (Wilson & Parker, 1996). Accordingly, temperature influences bioturbation activity indirectly through population dynamics of the amphipods.

References:
Crank, J., 1975, Mathematics of diffusion. Oxford University Press, Oxford
Wilson Jr, W. H., & Parker, K., 1996, The life history of the amphipod,*Corophium volutator*: the effects of temperature and shorebird predation. Journal of experimental marine biology and ecology, 196, 1, 239-250

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