Climate change induced low flow in perennial streams

Are there measures to mitigate the effects on macroinvertebrates?

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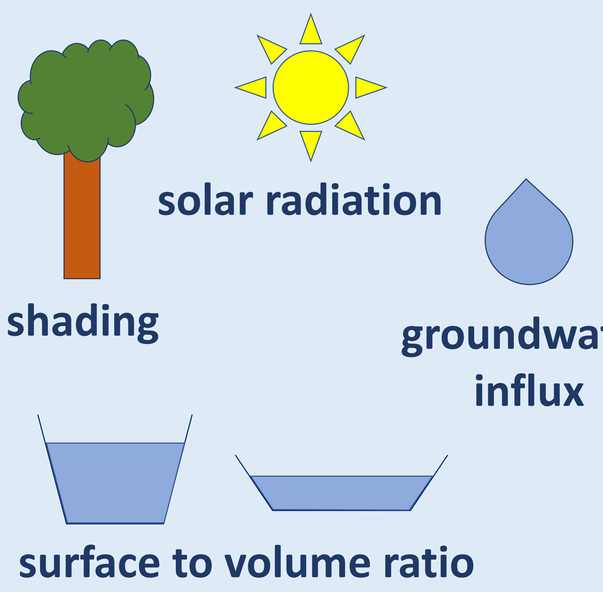
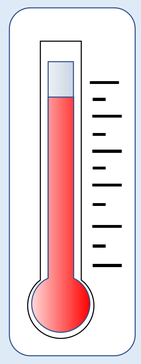
Methods

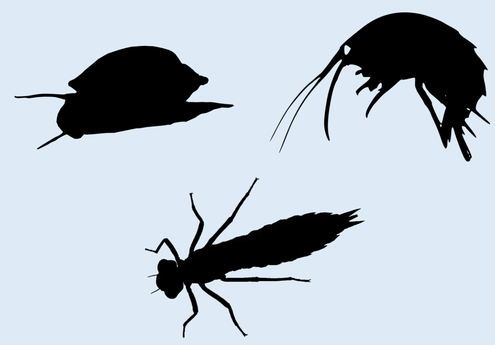
- 34 sampling sites in sand-bed streams (type 14) located in a lowland region in Germany
- Solar radiation on water surface calculated via drone images implementing shading
- Representative stream cross-sections measured to calculate surface to volume ratio
- Groundwater influx estimated based on expert knowledge; will be modelled in the future
- Water temperature measured every 20 minutes in summer prior to macroinvertebrate sampling
- Macroinvertebrates sampled in late summer 2022, directly after three months of a heavy drought, via multi habitat sampling

Hypotheses





water temperature



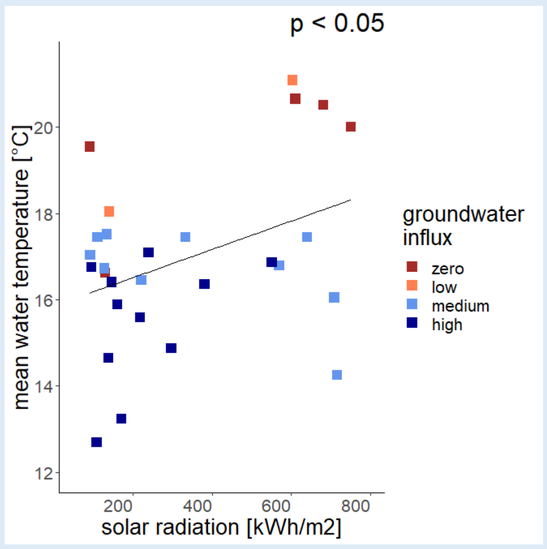
German Fauna Index

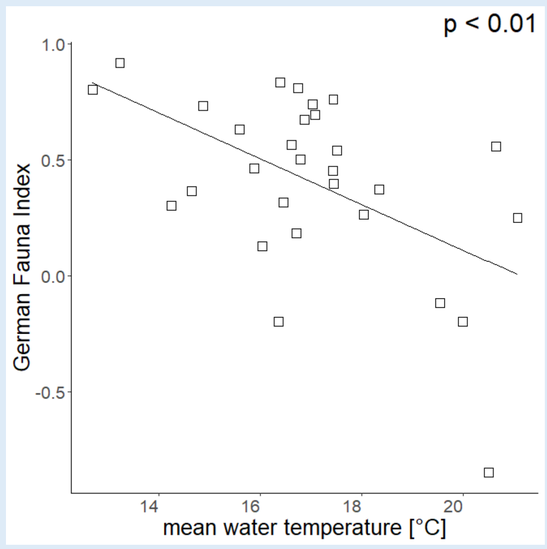
KLIWA Index

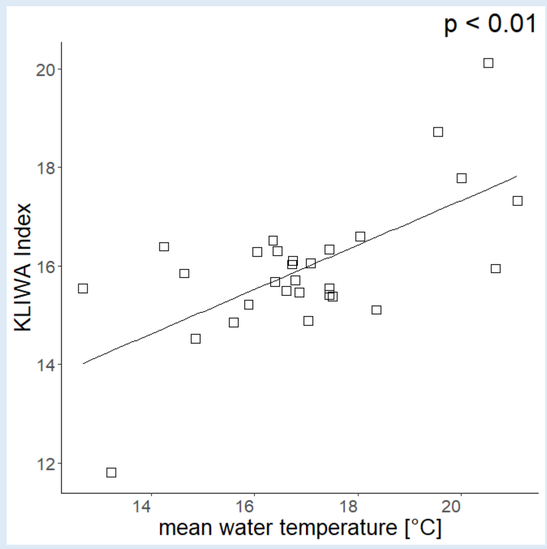
- Shading and small surface to volume ratio reduce water temperature in summer by reducing the amount of solar radiation reaching the water surface
- High groundwater influx reduces water temperature in summer

- Increase of water temperature leads to changes of macroinvertebrate community traits
- Lower German Fauna Index and higher KLIWA Index

Results







- Reduced solar radiation (by shading) and high groundwater influx reduce mean water temperature
- Surface to volume ratio has no effect

- Higher mean water temperature leads to lower German Fauna Index and higher KLIWA Index

Conclusion

Measures that

- decrease solar radiation input by shading
- increase groundwater influx …

… decrease water temperature …

… and may help to mitigate climate change effects on macroinvertebrate communities

Reference

https://www.phylopic.org/

[1]Aquatic ecology, Faculty of Biology, University of Duisburg-Essen

KLIMAWERK WASSER:LANDSCHAFT

GEFÖRDERT VOM Bundesministerium für Bildung und Forschung

FONA Forschung für Nachhaltigkeit

WaX Wasser-Extremereignisse

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