Predicting the net effect of biodiversity on stability

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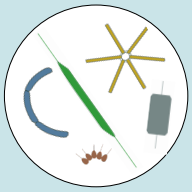
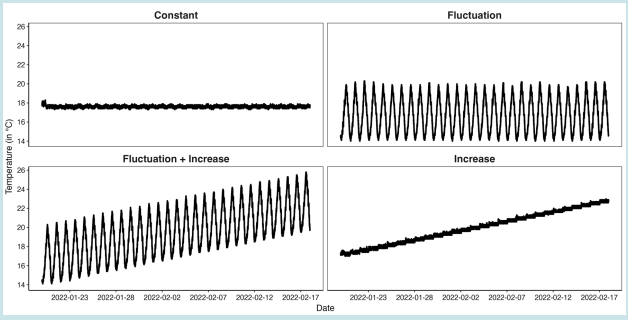
Background

- The question of how biodiversity affects ecosystem functioning has profited tremendously from quantifying expected functions based on species-specific performance and compare this expectation to observed rates (Net biodiversity effect)
- Here, we asses the net biodiversity effect on stability based on species-specific responses to temperature change. We expect that:
- **H1:** Functional stability cannot be predicted from species responses to the same environmental change alone, but is an emergent property of the community.
- **H2:** The net biodiversity effect increases with species richness because of higher functional redundancy.

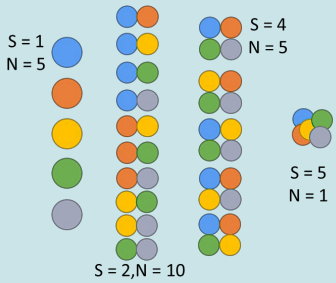


Methods

- We conducted a microcosm experiment using 5 diatom isolates from the North Sea in 3 species richness levels and 4 temperature treatments.
- Treatments consisted of a constant control, a temperature increase (+6°C), fluctuation (± 3 °C), and fluctuation (± 3 °C) around an increasing mean.

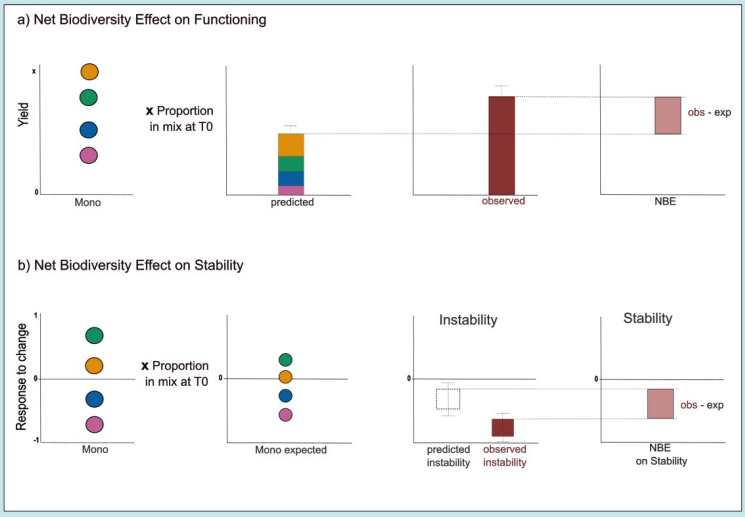


- Species richness level ranged from monocultures of the respective species (S = 1), two species combinations (S = 2), four species combinations (S = 4) to a mix-culture of all five species (S = 5).
- All treatment-richness combinations were replicated three times.



Framework

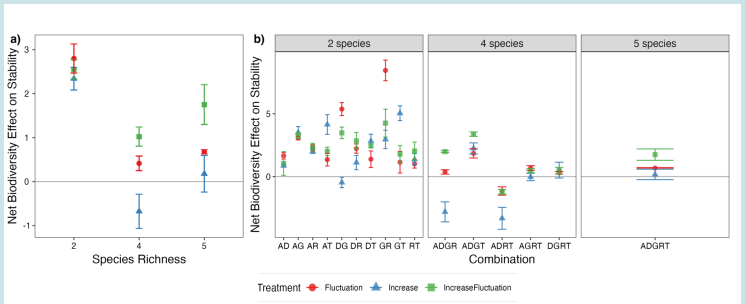
- Based on species responses in the monoculture and their realized response in the control treatment, we can predict (in-)stability of the community.



- By comparing predicted with observed (in-)stability, we can estimate the net biodiversity effect on stability.
- Positive effects occur if realized is higher than expected stability. Negative effects occur when observed stability is lower than predicted.

Results & Discussion

- The net effect of biodiversity is highest for 2 species combinations and differs among disturbances
- A key part of the variance reflects differences in species combinations indicating a high species identity effect



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