

Interaction between genetic diversity and climate change in seaweed germlings

B. Al-Janabi, I. Kruse, M. Wahl; GEOMAR, Kiel, Germany

Future climate change is simulated at the Kiel Benthocosm



↑ T: 5°C ↑ pCO₂: 600 μatm

Climate change factors are overlain as a delta-treatment onto naturally fluctuating regimes in the Kiel Benthocosms. A *Fucus vesiculosus* community is exposed to different conditions in 12 experimental units. Temperature and pCO₂ increase simulate the climate change predicted for 2100.

Intro & experimental design

Are *Fucus* germlings with higher genetic diversity doing better under climate change scenarios?

Genetic diversity confers potential for adaptation and is crucial for the conservation in a changing ocean.

To explore the significance of genetic diversity during early life, when highest selection occurs, we exposed two diversity levels of *Fucus vesiculosus* germlings settled on limestones to increased temperature and pCO₂. We hypothesize that diverse genotypes of *Fucus vesiculosus* germlings react differently on climate change factors.

Performance of the germlings (photosynthetic efficiency & growth) and mortality are measured for understanding which traits are selected under which conditions.

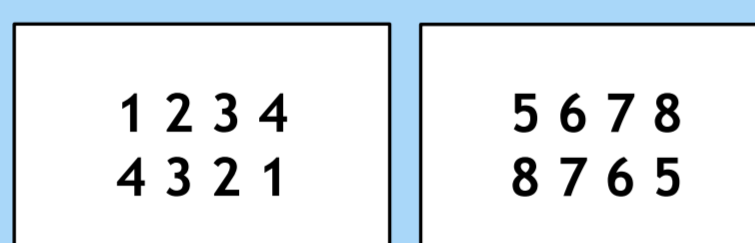
Experimental design: two diversity levels of *Fucus* germlings settled on limestones

Low diversity: offsprings of 1 parental pair each



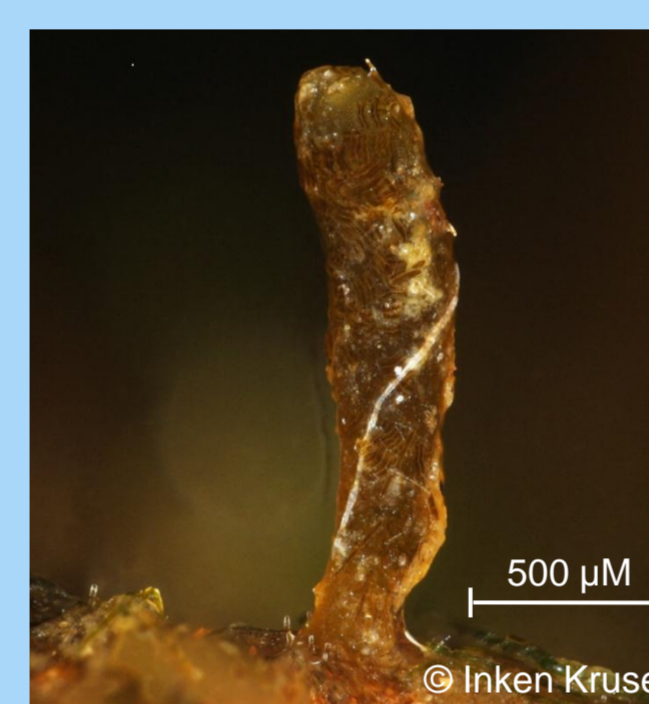
versus

High diversity: pool of 4 parental pair's offspring



First results

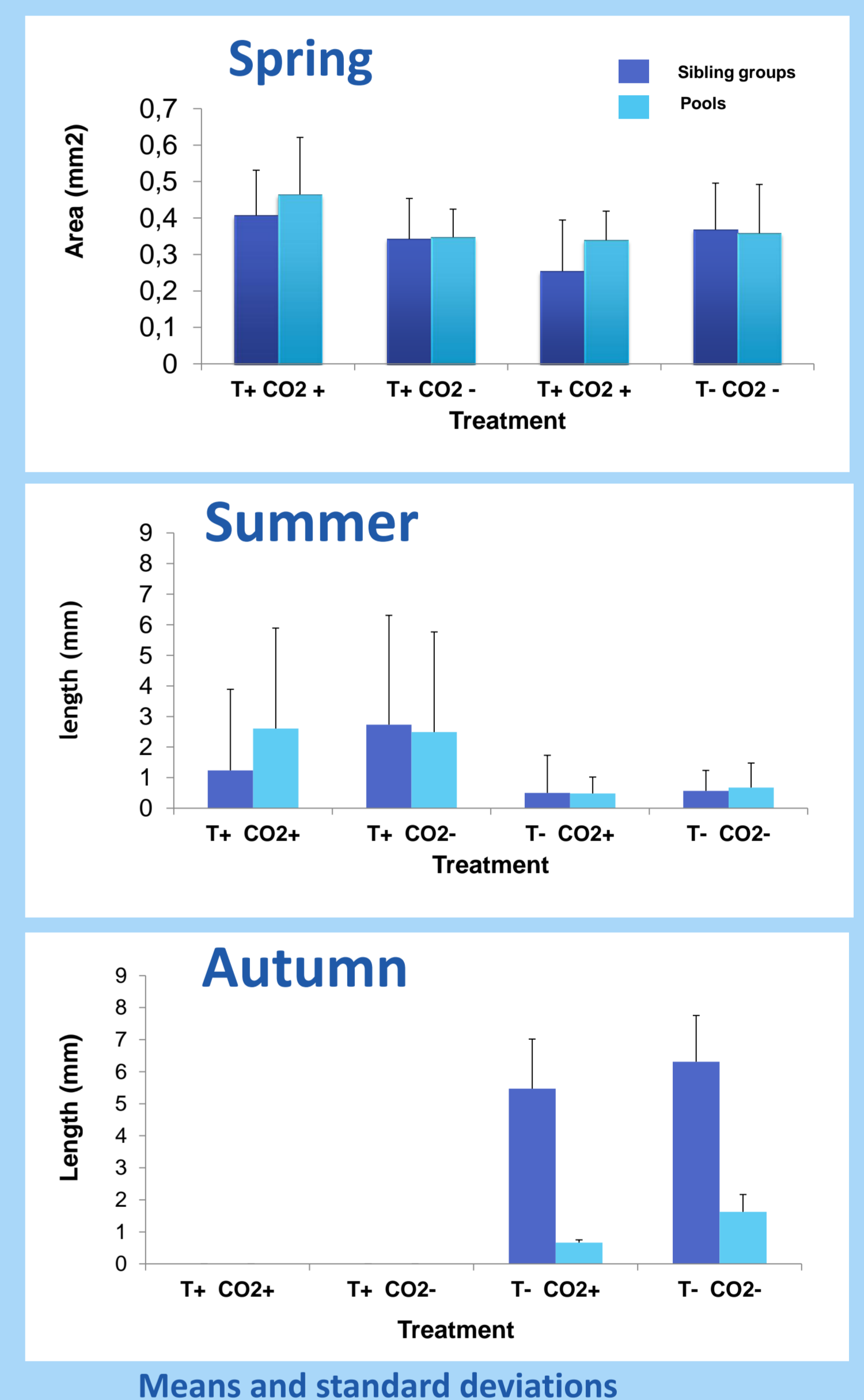
Climate change factors affect growth differently according to season



Fucus germling grown in the field for 4 months during summer



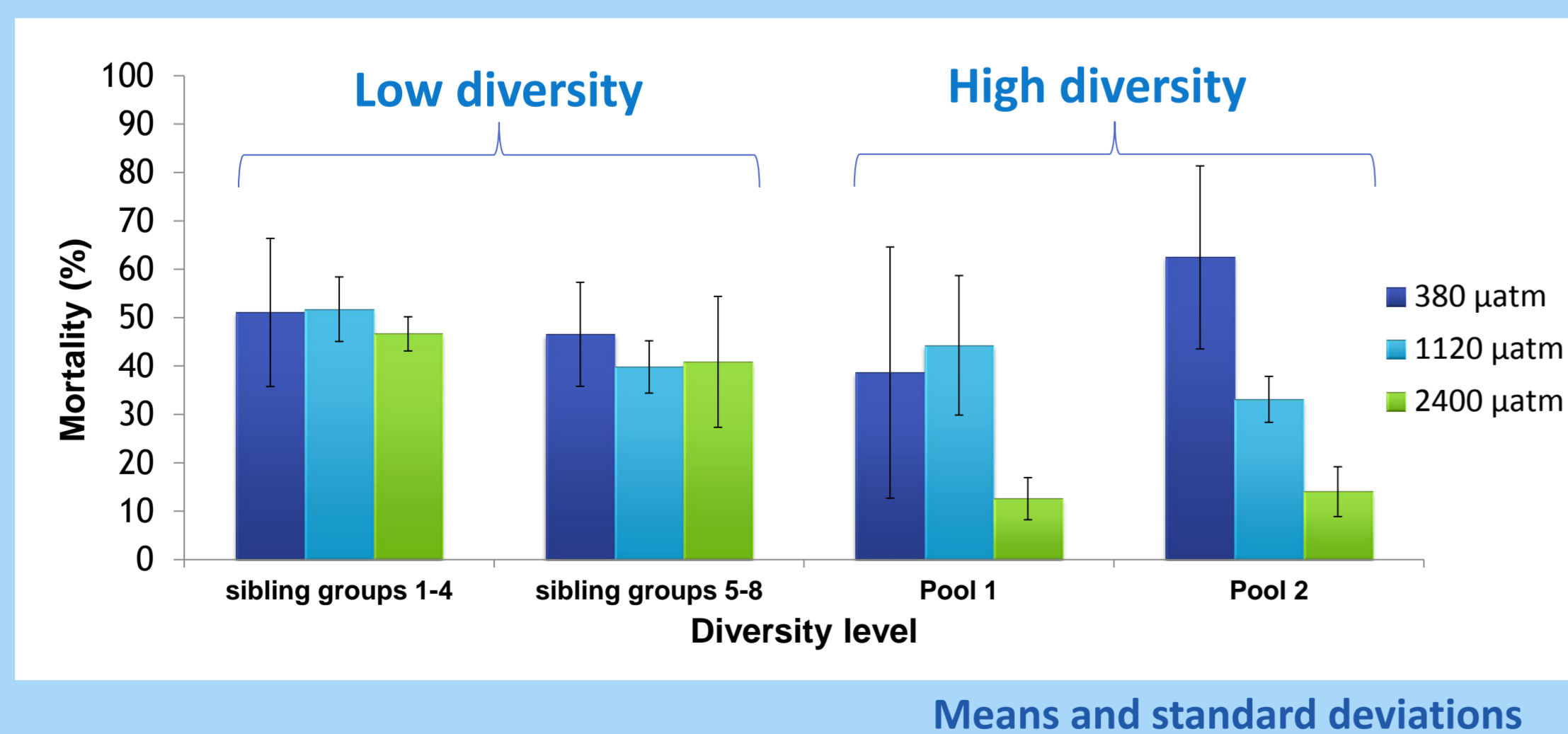
Fucus germling grown in the cosms for 8 months during winter & spring



Conclusion: Increased temperature leads to a stronger growth in spring, but also to higher mortality of germlings in summer.

First results

Diversity levels differ in their response to ocean acidification



Conclusion: Sibling groups show the same mortality under high pCO₂ conditions as under ambient conditions, but diverse pools theoretically consisting of the same genotypes showed higher survival. This may indicate that selection of pCO₂ favored genotypes has taken place.

Outlook

Genotyping of *Fucus vesiculosus* germlings

By genotyping parents and offsprings using microsatellite markers, we aim to

- follow the fate of the parent's alleles in the next generation, which was exposed to climate change conditions.
- determine to which degree genetic diversities are maintained in the high diversity level.
- follow changes in diversities over time during the course of the experiments.
- compare if allel combinations (individuals) in the sibling groups (low diversity level) perform/survive the same way as in the pools.