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 ↑ pCO_2: 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 pCO_2 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 pCO_2. 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

1	2	3	4	5	6	7	8

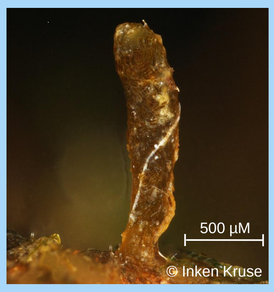
versus

High diversity: pool of 4 parental pair's offspring

1 2 3 4 4 3 2 1	5 6 7 8 8 7 6 5

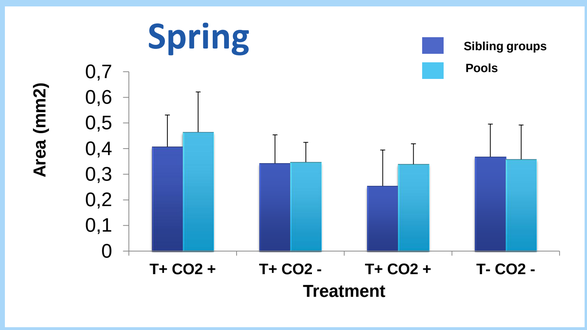
First results

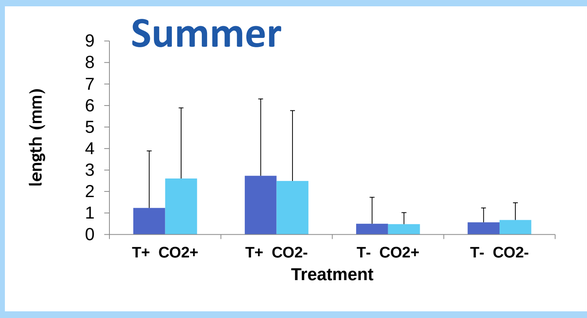
Climate change factors affect growth differently according to season

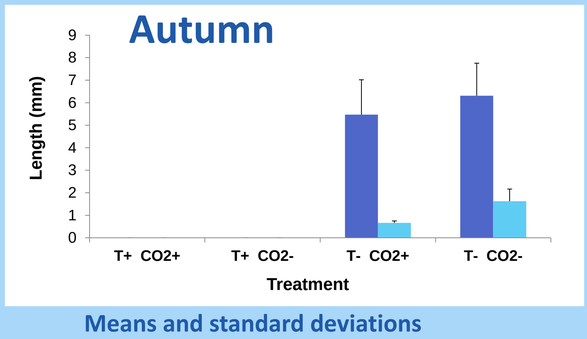


Fucus germling grown in the field for 4 months during summer

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





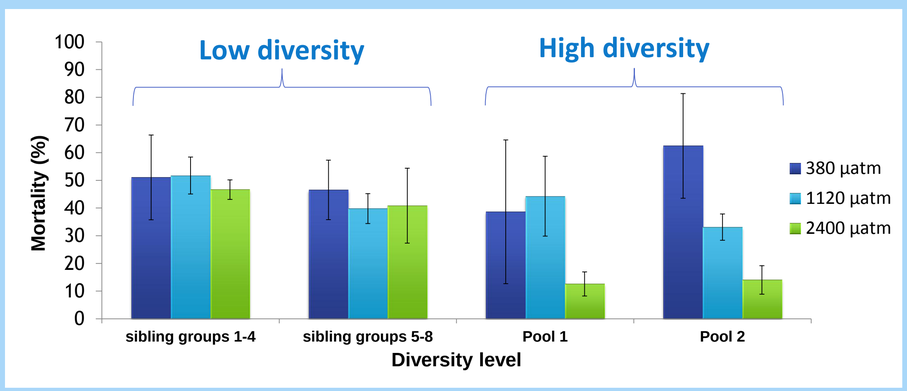


Means and standard deviations

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



Means and standard deviations

Conclusion: Sibling groups show the same mortality under high pCO_2 conditions as under ambient conditions, but diverse pools theoretically consisting of the same genotypes showed higher survival. This may indicate that selection of pCO_2 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 allels 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.

Contact: Balsam Al-Janabi (baljanabi@geomar.de)

BIOACID
Federal Ministry of Education and Research
GEOMAR Helmholtz Centre for Ocean Research Kiel
UNIVERSITY OF GOTHENBURG CENTRE FOR MARINE EVOLUTIONARY BIOLOGY