Consortium 2: Responses of benthic assemblages to interactive stress
WP 2.5: Interaction between intraspecific genetic diversity and environmental stress in early life-stage macroalgae

Does genetic diversity of *F. vesiculosus* germlings confer resistance towards climate change stress?

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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.**
A *Fucus vesiculosus* community is exposed to different conditions. Temperature and pCO2 increase simulate the **climate change predicted for 2100.**

Are *Fucus* germlings with high 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 *Fucus vesiculosus* germlings to increased temperature, pCO2 and nutrients. We **hypothesize** that **diverse genotypes react differently** on climate change factors. Performance of the germlings (photosynthetic efficiency & growth) and survival are measured coninuously.

Three diversity levels settled on limestones

Low diversity level ← **Single siblings**

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

versus

Medium diversity level ← **Quartets = 4 sibs**

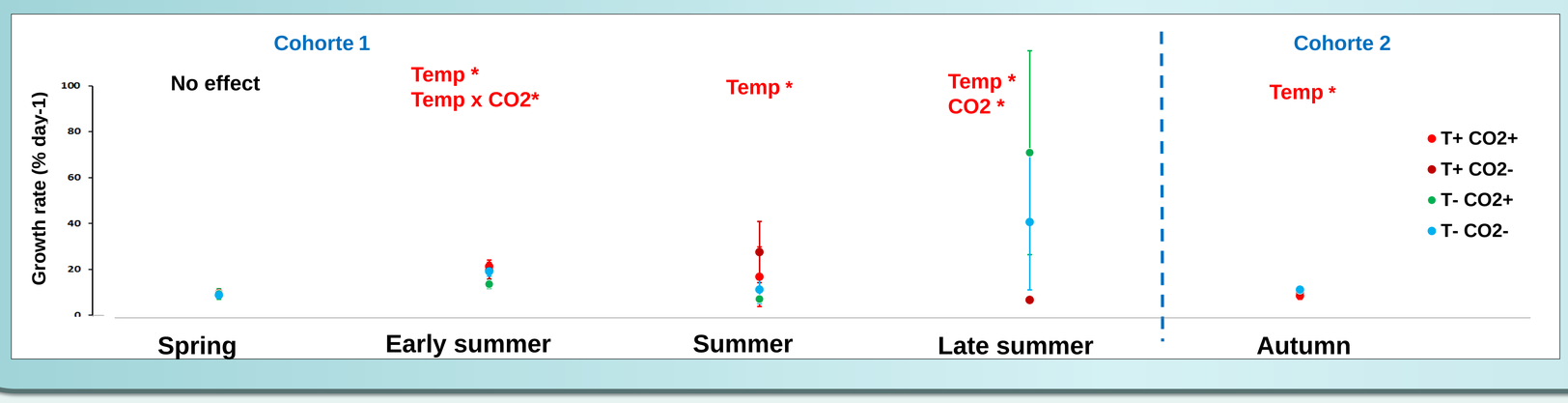
1 2 3 4 | 5 6 7 8 | 9 10 11 12 | 13 14 15 16

versus

High diversity level ← **Octets = 8 sibs**

1 2 3 4 5 6 7 8 | 9 10 11 12 13 14 15 16

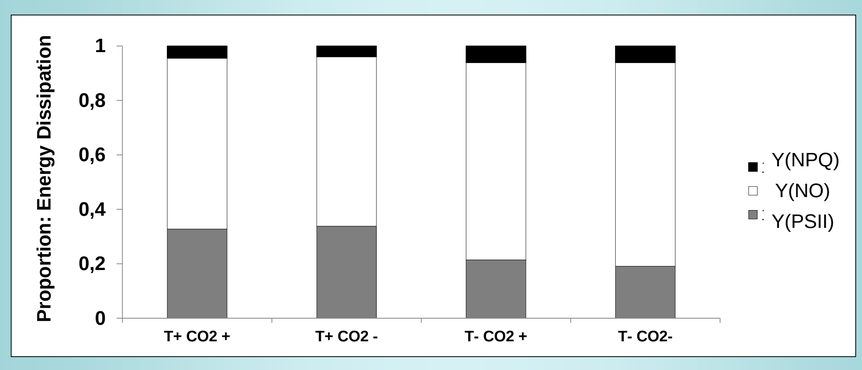
Climate change effects on seaweed germlings‘ growth depends on season



Higher **temperature** regimes **enhance growth rate** in spring and autumn, but lead to a high **mortality** during **summer**.
The **fertilisation effect** caused by high pCO2 is observed only during **summer**.

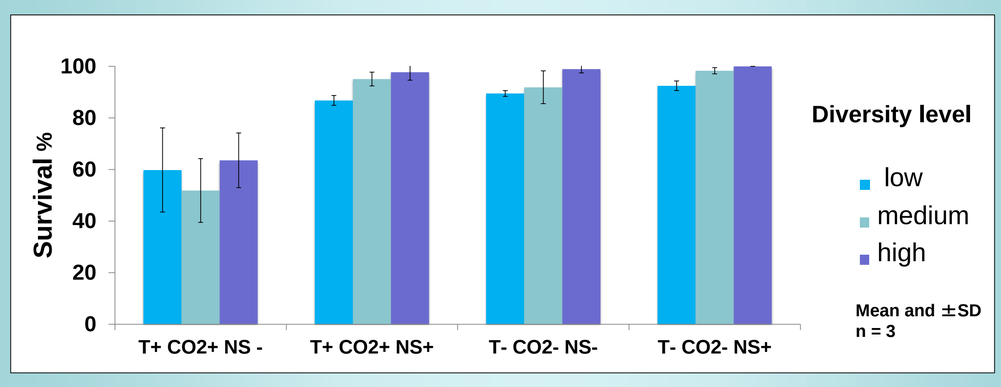
Means and standard deviations

Germlings‘ photosynthetic parameters are influenced at higher temperatures



The **high effective quantum yield** (Fv‘/Fm‘) **at elevated temperature** regimes indicates a better health condition for *Fucus* germlings in spring (p-value < 0,05).

Eutrophication increases survival of *Fucus* germlings



While a heat wave lead to low survival of germlings, **mortality was alleviated in presence of higher nutrient concentrations** (p-value < 0,05). Groups with higher genetic diversity presented higher survival than those of lower levels.

Conclusions

- The temperature effect is favourable in spring and autumn but harmful during summer. High nutrient level alleviates mortality during the summer heat wave.
- Ocean acidification increases growth during summer due to a fertilisation effect.
- Survival is increased for groups with a high genetic diversity.
- For detecting genotypes selected in diverse populations, microsattelite markers are applied.

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