The response of Arctic kelp communities to a future climate: tolerance, productivity, and functionality



This study was conducted in the frame of the project FACE-IT (The Future of Arctic Coastal Ecosystems – Identifying Transitions in Fjord Systems and Adjacent Coastal Areas). FACE-IT has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869154.

Ny-Ålesund Experiment

Examine the response of benthic mixed kelp communities to the multiple-drivers of warming from Atlantic water intrusion, freshening from glacial melt, and reduced irradiance due to the increased turbidity from meltwater runoff.

Objective: Determine if future environmental conditions result in reduced kelp community production, enhanced mortality, and changes in nutrient cycling.

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Methods

Ex-situ mesocosms of mixed kelp communities were maintained for 2 months in Ny-Ålesund, Svalbard, via a flow-through automated seawater delivery system that mixed heated and cooled ambient seawater from Kongsfjorden with fresh water (where applicable).



Results and conclusions

1) Hourly photosynthetic rates display nonsignificant differences across treatments.

2) Instantaneous photosynthetic rates remain optimal in the face of arctic climate change

3) Hourly and daily production can be robustly estimated from empirical models by pooling all short-term rates across treatments to predict kelp community productivity in Kongsfjorden.



4) The compensation irradiance estimated for mixed kelp communities at a depth of 10 m with a median time of day is 12.5 mmol photons m⁻² h⁻¹.







