

Experimental study suggests tolerance of Arctic kelp to future climate change

Cale A. Miller¹, Anaïs Lebrun¹, Jean-Pierre Gattuso^{1,2}, Pierre Urrutti¹, Samir Alliouane¹, Frédéric Gazeau¹, Steeve Comeau¹

¹Sorbonne Université, CNRS, Laboratoire d'Océanographie de Villefranche, 06230 Villefranche-sur-Mer, France

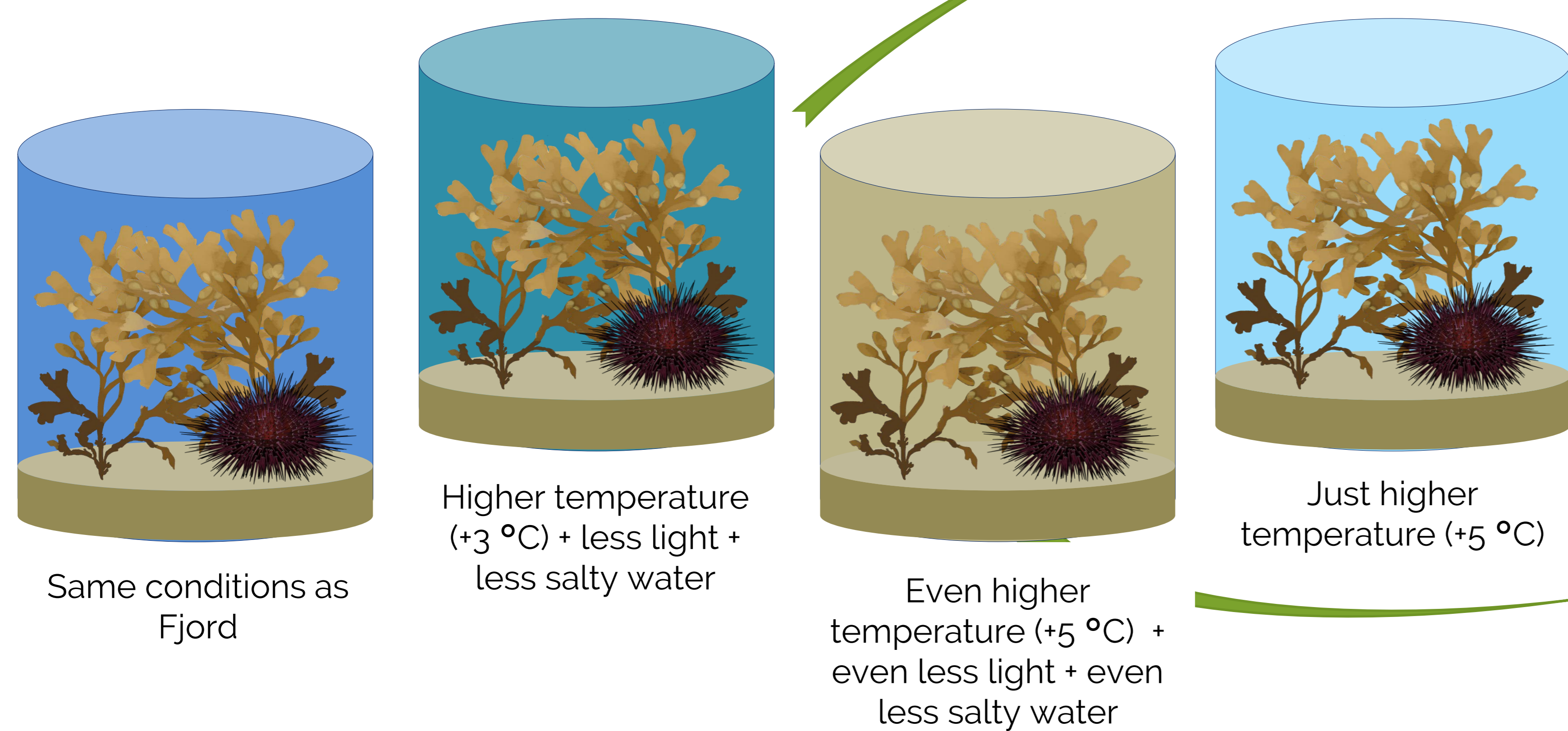
²Institute for Sustainable Development and International Relations, Science Po, Paris, France

cale.miller@imev-mer.fr

The fjords of Svalbard are undergoing rapid climate change due to incoming Atlantic water mixing with cold Arctic water in combination with a warming atmosphere. Making this process worse is the rapid retreat of sea-ice and glaciers, which historically have helped cool the region by reflecting sunlight. These environmental changes are restructuring the habitats of Arctic fjords such as kelp (macroalgae) communities. To examine the response of habitat forming kelp communities to a future Arctic, experimentally changing the physical and chemical conditions reflects the future Arctic ecosystem.

Tanks 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 seawater from Kongsfjorden.

In each of 12 tanks, about 4 kg of kelp (3 species) and various small animals (e.g., sea urchins) were exposed to 4 different future scenarios.



Experimental set-up in Ny-Ålesund, Kongsfjorden, Svalbard



Sugar kelp

Photosynthesis did not change in response to decreased salinity or increased temperature. Kelp production decreased slightly as a result of continuous low light conditions. Kelp photosynthesis and biomass production appear tolerant under future Arctic conditions but expansion of kelp may be reduced if light is perpetually reduced.