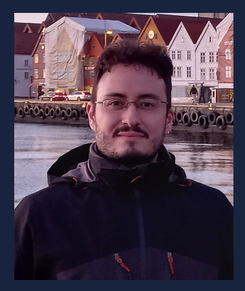
The green guardians of the coast

Effects of seasonality on the ecology and distribution of Norwegian fucoid species in a climate change context.



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Background and motivation

My career is linked to the study of impacts affecting coastal ecosystems. From my masters to my PhD I got experience in impacts of fish farm escapees on local fauna; effects of aquaculture nutrients on pelagic processes, taxonomy, abundance and composition of pelagic species; effects of aquaculture on benthic organisms and the use of macroalgae bioremediation of anthropic-derived nutrients and other human-induced effects on the environment.

When the SEAS opportunity came up, I realized that the program could provide the resources, support and connections I was looking for when I embarked at the postdoctoral stage. This is the perfect scenario for me to train my inter- and trans-disciplinary research and intersectoral collaboration skills while establishing connections with other academic entities and the industry.

And being in Bergen is, and will always be, a plus.

Project description

I am currently invested on the study of **seasonality-induced changes in macroalgae fucoids and their distribution under a climate-change context.** Dexterity in the analysis of high-latitude macroalgae responses to changing environmental conditions is key in predicting future outcomes and establishing management policies involved in adjacent fields such as conservation or exploitation.

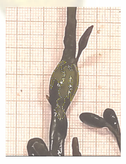
Examples of intertidal fucoids that can be found in the Norwegian coast: *Ascophyllum nodosum*, *Fucus spiralis*, *Fucus vesiculosus* and *Fucus serratus*.

Main questions

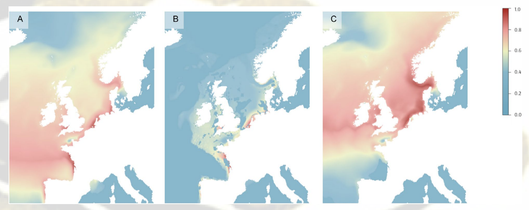
Example of fieldwork measuring and the grazer *Littorina obtusata.* Other important grazer of the area is *Patella vulgata.*

How is grazing, as a top-down mechanism, affected by climate change and what consequences are in store for macroalgae?

How resilient are different populations of macroalgae to climate change? Is there an effect on their phenology or defense mechanisms?



Examples of indoor experiments and area grazed of Ascophyllum.



Example of Species distribution models. Westmeijer *et al.* 2019

How will climate change affect the spread of northern fucoids and how will species-specific physiology impact these patterns?

How have certain phenological traits of this species (e.g., timing of reproduction) changed over the course of the years?

Reproductive structures of *Fucus vesiculosus.*

Aims (and/or milestones)

- So far, I set up collaborations with other SEAS fellows, labs, companies and research institutions to ensure research outputs related to population genetics, carbon storage and modelling.
- Studied the top-down effect of normal grazing trough a hot season on the growth of *A. nodosum.*
- Explored the defense mechanism of *A. nodosum* against herbivory under climate change conditions.
- Study the resilience of Fucoid populations in Norway's Fjords.

Marine sustainability

Macroalgae are photosynthetic organisms that sequester CO_2, are good pollution bioindicators, are a fast, reliable source of biomass and vitamins, serve as a nursery of vast amounts of fauna and some macroalgae species are 'engineers' of the ecosystem.

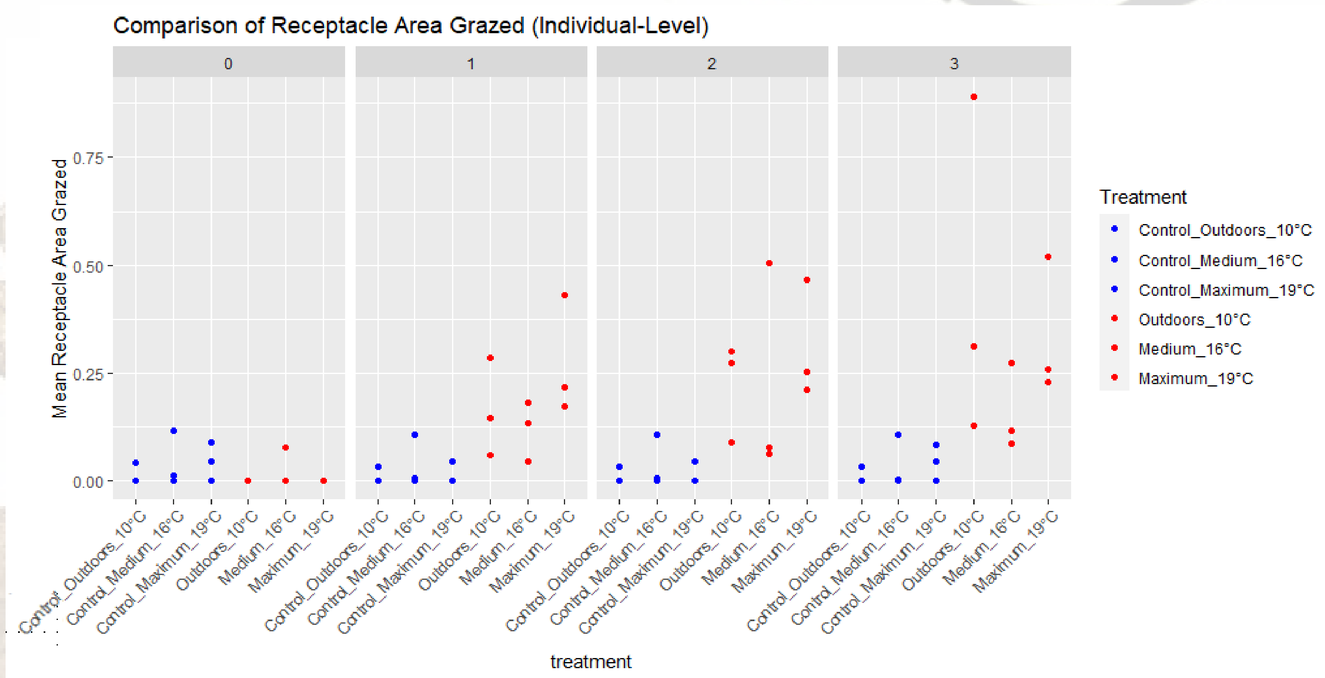


Figure depicting one of the results of my experiments focused on the analysis of grazing activity of *L. obtusata* on receptacles –reproductive structures- of *A. nodosum* through the course of three weeks. We can observe how the grazers increase their herbivory on these structures, becoming a risk to the macroalgae.

Highlighted results (and/or activities)

>Research insight & results:

-Grazing seems to stimulate growth in *Ascophyllum nodosum* at medium and lower intertidal zones of the coast.

-Increased grazing of *L. obtusata* due to higher temperature regimes in *A. nodosum* tanks.

>Ongoing & next steps:

-Follow-up preference experiment in preparation.

-Ongoing phlorotannin content analysis in different parts of grazed *A. nodosum*.

-Involvement in DNA extraction and analysis techniques.

-Future collaboration in mechanistic niche modelling.

>Other activities:

- *Skype a scientist* initiative.
- Norwegian course for employees.
- Conference: Symposium on the Effects of Climate Change on the World's Ocean (ECCWO5), BEScience IV.
- Featured in a documentary aired in Spanish TV –*Valencians al món-.*
- Research cruise to Sognefjord on board of the OceanX vessel.
- SEAS Outreach Group: Blog posts, podcast programs and other activities.
- Established SEAS connections – Project in common with the Chemistry department through SEAS fellows.

Supervisory team

Kjersti Sjøtun

Øystein Varpe

Collaborators: UiT, Nord University, NIVA.

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