Where, and how big, are the Nordic kelp forests?

New data on the distribution and area of kelp forests in the Nordic region provides a reference point for assessing large-scale changes in the future.

CLIMATE CHANGE
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There are some things we all know or can guess about kelp forests. They provide food and shelter for many fish and other marine creatures. They are also a potential source of food for the world's growing population. However, they could also help mitigate climate change.

Research suggests that kelp forests could contribute substantially to carbon sequestration, the process of capturing and storing atmospheric carbon dioxide. Although scientists still know little about the extent to which macroalgae such as kelp sequester carbon, if we conserve and restore our oceans' kelp forests, they might serve as one more weapon in our battle against climate change. But before we can get to this point – and before we can convince policymakers of their importance – we need data on their distribution and the area they occupy.

A team of researchers supported by the EU-funded FACE-IT project has now presented the first comprehensive distribution modelling study of kelp forests across the Nordics, encompassing Denmark, the Faroe Islands, Finland, Greenland, Iceland, Norway and Sweden. They compiled quantitative data of the Nordic region's dominant kelp genera, Laminaria and Saccharina, allowing them to distinguish kelp forests (with dense or moderately dense coverage) from areas where only single or few plants are found. The study's findings provide a baseline for the assessment of large-scale changes in kelp forest distribution in the Nordic region.

To analyse and predict the distribution of kelp forests across the region based on numerous potentially interacting environmental variables, the team used boosted

regression trees (BRTs), “a method that combines the advantages of machine learning and statistical regression techniques,” according to the study. Separate BRT models were used for Laminaria and Saccharina.

The models captured the environmental affinities of kelp and predicted the presence of kelp forests highly accurately despite the large magnitude of the analyses. Overall, dense kelp forests can be found along the rocky shores of all the Nordic countries, except in the brackish Baltic Sea. The largest dense kelp forests are in Greenland, Iceland and Norway.

Kelp distribution and forest areas

According to the BRT model, Laminaria forests are located “along the Norwegian coast including Svalbard …, on the western coasts of Sweden and Denmark, around the Faroe Islands and the southern coast of Iceland, and in some scattered locations along the coast of Greenland.” For Saccharina, the model predicted forests to be present “along the Norwegian coast north to Lofoten and on Svalbard …, around West, South and East Greenland and at scattered locations in the other Nordic countries.”

Additionally, large areas of Laminaria forests are mainly estimated for Iceland and Norway, while Saccharina forests are estimated to be largest in Greenland and Norway.

Environmental variables

Taking environmental variables into account, the results suggested “that Laminaria forests are associated with low sea ice cover, bottom depths shallower than 30 m and high wave fetch,” the study reports. For Saccharina, “the results again indicated that forests are found in areas shallower than 30 m. In addition, Saccharina forests responded negatively to wave fetch, in contrast to Laminaria.”

The aim of FACE-IT (The future of Arctic coastal ecosystems - Identifying transitions in fjord systems and adjacent coastal areas) is to enable the adaptive co-management of social-ecological fjord systems in the Arctic. The project ends in 2024.

For more information, please see:
FACE-IT project website

Keywords

FACE-IT, forest, kelp, kelp forest, Laminaria, Saccharina, distribution, Nordic, Nordic region

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