Warmer climate threatens the seaweed forest

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The bladderwrack is an important species in coastal ecosystems that forms seaweed forests where fish, crabs, snails, and many other organisms live. Credit: Susanne Liljenström

The future climate could have serious consequences for valuable coastal ecosystems. Warmer, more acidic, and less saline water make the bladderwrack more fragile and appetizing for snails and other grazers. This is shown in a new Ph.D. thesis from the University of Gothenburg.

Alexandra Kinnby at the Department of Marine Sciences has studied climate effects on the bladderwrack in her thesis. The bladderwrack is an important species in coastal ecosystems that forms seaweed forests where fish, crabs, snails, and many other organisms live.

"I have evaluated how factors such as reduced salinity, ocean acidification, and increased temperature affect, for example, growth and biochemical content in the seaweed. I've also looked at how the seaweed's interaction with other organisms may change in the future," says Alexandra Kinnby.

Climate-stressed seaweeds become defenseless

In the seaweed forest, there are snails of various kinds. The flat periwinkle, Littorina obtusata, is one of the few species that graze and eat the seaweed's hard-to-digest fronds. In defense, grazed seaweeds can produce bad tasting chemicals, called phlorotannins. But when the bladderwrack is exposed to climate stress, this production decreases.

"My most important findings are that the algae's chemical defenses against grazers deteriorate, and that they become more fragile when they are allowed to grow under future climatic conditions. All in all, this can lead to the seaweed forests being weakened and more easily torn apart during storms. This has consequences for many organisms that depend on the seaweed."

Some populations are more resilient

Alexandra Kinnby's research differs from similar research in that it's based on studies of the same species, but on different populations from several areas along the Swedish coast. By comparing effects on the algae's physiological response with genetic data, Alexandra Kinnby was able to establish that some populations are less sensitive than others.

"The fact that there are large differences between different populations of the same species can be important to keep in mind, for example when choosing which populations to conserve or restore, but also if you choose to move seaweed that can better cope with climate change to areas where

the local population is not equally resilient."

Seaweed from the Baltic Sea is particularly sensitive

The dissertation also contains a study on the impact of climate effects on reproduction and early life stages of the bladderwrack. At elevated water temperatures, the reproductive capacity of the bladderwrack deteriorated sharply, and seaweed grown in the lower salinity of the southern Baltic Sea was particularly sensitive. This effect could be particularly serious because the seaweed in the Baltic Sea is already living at the limit of its capacity.

"Climate change will of course also affect other species and organisms, but if habitat-forming species, such as the bladderwrack, are greatly affected, it can have large-scale consequences for entire ecosystems," says Alexandra Kinnby.

More information: Habitat forming seaweeds in a changing climate: gupea.ub.gu.se/handle/2077/68048?locale=sv

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