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Losses of eelgrass beds give rise to large emissions of carbon and nutrients

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Summary: Losses of important eelgrass meadows in western Sweden since the 1980s have led to considerable bottom erosion and the release of carbon and nitrogen; substances that contribute to increasing climate change and eutrophication.

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FULL STORY

Losses of important eelgrass meadows in western Sweden since the 1980s have led to considerable bottom erosion and the release of carbon and nitrogen; substances that contribute to increasing climate change and eutrophication. This is shown in a new study by researchers at the University of Gothenburg, Stockholm University, Åbo Akademi University and the University of Southern Denmark, published in the journal *Ecosphere*.

Eelgrass beds play an important role for coastal ecosystems and provide humans with several valuable ecosystem services. They constitute important habitats for cod and other commercial dish species, they increase biodiversity and provide clearer water by stabilizing the bottom. They also capture and store organic material rich in carbon and nutrients for a long time in the sediment, which reduces climate effects and eutrophication. The ongoing loss of eelgrass meadows along e.g. the Swedish West Coast worries researchers that carbon and nutrients can be released from sediment when the protective meadow disappears. However, studies on this have been lacking.

An international research group, led by researchers at the University of Gothenburg, is now publishing a study in the journal Ecosphere, which for the first time can show that losses of eelgrass give rise to significant emissions of both carbon and nutrients to the environment. The researchers compared sediments in eelgrass meadows with areas where the meadows have been lost in southern Bohuslän on the Swedish west coast, where large losses of eelgrass have occurred since the 1980s. The results show that Bohuslän's eelgrass beds are unusually efficient at storing both carbon and nutrients in the sediment, especially meadows in wave-protected areas that have unusually high levels.

"These meadows can have several meter-thick layers of organically rich sediment, which makes them global 'hot-spots' for carbon and nitrogen storage," says Per Moksnes who is the main author of the study.

The study also shows that the levels of carbon and nitrogen are several times lower in the sediment where eelgrass beds have disappeared, and indicates that at least 35 cm of the organically rich sediment has eroded away and released carbon and nitrogen to the environment. The results also show that meadows in protected areas, with the largest layers of carbon and nitrogen, are the ones that have the most sensitive sediment, and are most easily eroded after a loss of eelgrass. Conservative calculations estimate that for every hectare of eelgrass that disappears, an average of over 60 tonnes of carbon and 6.6 tonnes of nitrogen are released into the environment.

"The emissions of nitrogen from one hectare of lost eelgrass are in the same order of magnitude as the average annual emissions from a fish farm in Sweden. It is therefore important that these emissions are taken into account in permit trials concerning activities that damage eelgrass," says Per Moksnes.

"Eelgrass meadows are disappearing in many other countries than Sweden. All over the world, sea grasses are declining; especially in areas with a high level of tourism and construction activities. It is important to conserve existing meadows and to re-establish lost meadows," says co-author Marianne Holmer, who is an expert in coastal ecology and a professor at University of Southern Denmark.

Restoration of eelgrass meadows is presently carried out both in Denmark and Sweden, where new eelgrass shoots are planted in fjords and other protected coastal areas, where eelgrass meadows once were common. Such an approach is a so called nature based solution: By planting new meadows, you use nature's own solutions to capture and store carbon and nutrients instead of applying, say, technological solutions.

Denmark, Finland and Sweden are members of International Union for Conservation of Nature; an organization focused on addressing societal challenges like climate change, loss of biodiversity and food security with nature based solutions.

The study also shows that the cost to society to compensate for these emissions is significantly higher for nitrogen (SEK 1.3 million per hectare of lost eelgrass) than for carbon (SEK 71,000 per hectare) and that Bohuslän's eelgrass is therefore extra important to counteract eutrophication.

In the fjord areas within Marstrand in southern Bohuslän, almost 10 km^2 of eelgrass has disappeared since the 1980s, which has resulted in an estimated emission of over 60,000 tonnes of carbon and 6,600 tonnes of nitrogen over a 20-year period.

"The estimated emission of nitrogen from this loss is three times greater than the annual load of nitrogen to the Skagerrak from all Swedish watercourses, and would cost society about SEK 1.3 billion to compensate," says Per Moksnes.

The results strengthen the view that eelgrass meadows are very important for both the environment and humans, where old meadows in protected areas are extra important as they protect their large sediment stocks of carbon and nutrients from leakage. Eelgrass beds in wave-protected areas are today particularly vulnerable as humans like to build docks and marinas in these areas, and as the loose sediments are extra sensitive from waves from boats.

"We hope that the study can shed light on the importance of identifying and increasing the protection of these valuable and sensitive eelgrass meadows," concludes Per Moksnes.

The study was carried out within the interdisciplinary research program Zorro at the University of Gothenburg in collaboration with researchers at Stockholm University, Åbo Akademi in Finland and the University of Southern Denmark in Denmark.

Story Source:

Materials provided by **University of Gothenburg**. *Note: Content may be edited for style and length.*

Journal Reference:

1. Per-Olav Moksnes, Maria Emilia Röhr, Marianne Holmer, Johan S. Eklöf, Louise Eriander, Eduardo Infantes, Christoffer Boström. **Major impacts and societal costs of seagrass loss on sediment carbon and nitrogen stocks**. *Ecosphere*, 2021; 12 (7) DOI: 10.1002/ecs2.3658

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