



ALLIANCE™

[.https://www.globalseafood.org](https://www.globalseafood.org)

Intelligence

Can seagrass and mangrove restoration help mitigate ocean acidification and climate change?

1 June 2023

By Responsible Seafood Advocate

Seagrass and mangrove restoration could remove carbon and combat ocean acidification through 'novel pathway'

Researchers at the Georgia Institute of Technology and Yale University are proposing a novel pathway through which coastal ecosystem restoration can permanently capture carbon dioxide from the atmosphere. Seagrass and mangroves – known as blue carbon ecosystems – naturally capture carbon through photosynthesis, which converts carbon dioxide into living tissue.

Restoring these ecosystems could potentially benefit local flora and fauna and help to energize coastal economies. But the researchers now suggest that restoring them could also remove additional carbon through a novel pathway while combating increasing acidity in the ocean.

“Mangroves and seagrasses extract carbon dioxide from the atmosphere all day long and turn it into biomass,” said Chris Reinhard, an associate professor in the School of Earth and Atmospheric Sciences (EAS). “Some of this biomass can get buried in sediments, and if it stays there, then you’ve basically just removed carbon dioxide from the atmosphere.”



Researchers suggest seagrass and mangrove restoration could also remove carbon through a novel pathway while combating ocean acidification. Photo by [Zaid Ahmed](#) (<https://www.pexels.com/photo/mangrove-tree-roots-reflecting-in-river-12708316/>).

There are two major types of carbon that cycle through the Earth's system: Organic carbon and inorganic carbon. Organic carbon is contained in living matter, such as algae, plants, animals, and even humans. This form of carbon can remove carbon dioxide from the atmosphere temporarily, but if it becomes buried in sediments at the seafloor, it can lead to permanent carbon dioxide removal.

**SEAFOOD FROM
SCOTLAND**

See you in St. John!



(<https://events.seafoodfromscotland.org/>).

Inorganic carbon can also be found in many forms, including rocks and minerals, but is present as a significant dissolved component of ocean water. Roughly 30 percent of the carbon emitted by human activities since the industrial revolution is now stored as dissolved inorganic carbon in the ocean.

Although carbon dioxide stored as organic carbon can be disrupted, effectively redistributing carbon dioxide back into the atmosphere, carbon dioxide removal by inorganic carbon is potentially much more durable.

Reinvigorating coastal ecosystems as a technique for mitigating carbon emissions is not a new idea, but past research has focused on carbon removal through organic carbon burial and has not explored the potential for carbon removal through the formation of inorganic carbon. Furthermore, storing carbon dioxide as inorganic carbon could help mitigate ocean acidification, because the chemical processes that lead to carbon capture as inorganic carbon involves alkalizing ocean waters.



From forest to plate, a shrimp redefining 'farmed'

The explosive growth of shrimp farming has long been associated with mangrove deforestation in Southeast Asia. A silvofishery method of producing the popular seafood is protecting the fragile ecosystems in Vietnam. A hungry marketplace is reaping the rewards.



Global Seafood Alliance

3

“The basic idea here is that you are shifting the acid-base balance of the ocean to drive conversion of carbon dioxide in the atmosphere to inorganic carbon in the ocean,” said Reinhard. “This means that the process can help to partially offset the negative ecological consequences of ocean acidification.”

To explore how effective restoring coastal ecosystems could be for inorganic carbon capture, the researchers built a numerical model to represent the chemistry and physics of sedimentary systems – the complex mixture of solid particles, living organisms, and seawater that accumulates at the seafloor. A key advance of the model is that it specifically tracks the potential benefits of restored mangrove or seagrass ecosystems and their impacts on organic and inorganic carbon cycling. It also calculates the effects of other greenhouse gases, such as methane, that can sometimes be created in the process of restoring mangrove and seagrass ecosystems.

“This model comes up with representations for the rates of carbon transformation in the sediment based on how much mangrove is growing above the sediment,” said Noah Planavsky, senior author on the study and professor of Earth and planetary sciences at Yale. “We found that across an extremely large range of scenarios, restoration of blue carbon ecosystems leads to durable carbon dioxide removal as dissolved inorganic carbon.”

The team hopes this research could provide an impetus to protect current coastal ecosystems and economically incentivize the restoration of degraded ecosystems, potentially as a new form of carbon offset.

“Companies that are trying to offset their own emissions could potentially purchase carbon removal through funding restoration of coastal ecosystems,” Reinhard said. “This could help rebuild these ecosystems and all of the environmental benefits they provide, while leading to durable carbon dioxide removal from the atmosphere.”

[Read more about the study here \(https://www.nature.com/articles/s41893-023-01128-2\)](https://www.nature.com/articles/s41893-023-01128-2).

[Follow the *Advocate* on Twitter @GSA_Advocate \(https://twitter.com/GSA_Advocate\)](https://twitter.com/GSA_Advocate)

Author



RESPONSIBLE SEAFOOD ADVOCATE

editor@globalseafood.org (<mailto:editor@globalseafood.org>).

Copyright © 2023 Global Seafood Alliance

All rights reserved.