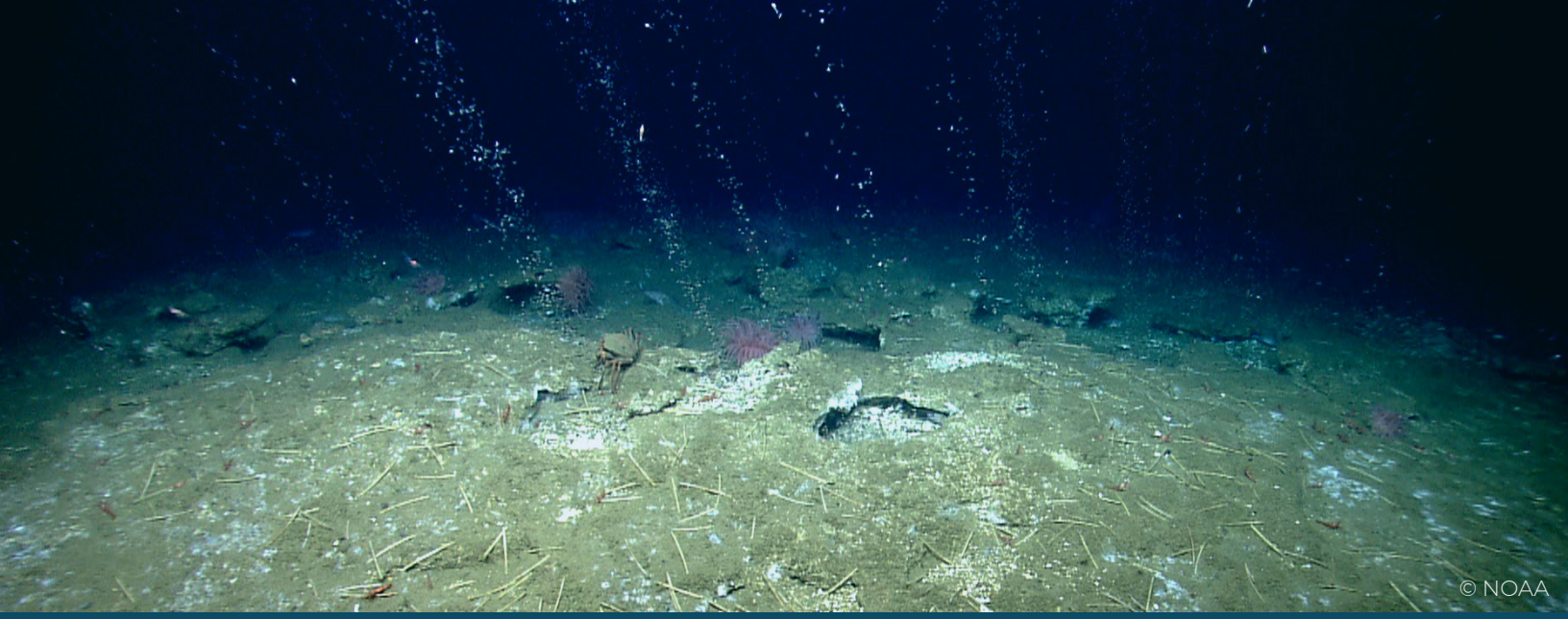


AS CANADA'S MARINE PROTECTED AREA NETWORK EXPANDS, SEAFLOOR CARBON DESERVES CONSIDERATION

Protecting carbon-rich seabed sediments could provide climate change mitigation benefits while conserving unique biodiversity.

HIGHLIGHTS

- Canada recognizes that protecting seagrass, saltmarsh and kelp habitats within marine protected and conserved areas can help mitigate climate change.
- This study suggests that including seabed sediment habitats that store and/or accumulate large densities of organic carbon could bring similar benefits.
- Beyond their climate value, carbon-rich seabed sediment habitats also contain unique, diverse and often fragile species assemblages that deserve protection.
- Current and proposed marine protected and conserved areas encompass only 20% of total carbon stocks and 20% of the carbon-rich seabed areas on Canada's continental margin.
- This study identifies potential priority seabed areas based on their estimated seabed carbon stocks, carbon sensitivity and ecological significance.

BLUE CARBON CANADA

OCEANS NORTH

NSERC CRSNG

mitacs

UVIC

Graham Epstein, Susanna D. Fuller, Sophia C. Johannessen, Emily M. Rubidge, Melissa Turner, and Julia K. Baum. 2025. Protection of seabed sediments in Canada's marine conservation network for potential climate change mitigation co-benefit. *FACETS*. 10: 1-14. https://doi.org/10.1139/facets-2024-0080

Marine protected and conserved areas (MCAs) are primarily designated to protect or restore biodiversity; however, planning processes also increasingly recognize that MCAs can provide climate change mitigation co-benefits[1,2]. As part of its commitments under the Global Biodiversity Framework, Canada is expected to rapidly expand its MCA network from 15.5% of Canadian waters to at least 25% by 2025 and 30% by 2030. Although the protection of habitats that capture and store carbon is defined as a potential benefit of MCA designation by Fisheries and Oceans Canada, only coastal vegetated blue carbon ecosystems such as salt marshes, kelp forests and seagrass beds are explicitly included in the National Framework for Canada's Network of Marine Protected Areas[1].

This new study evaluates the evidence for integrating seabed sediment carbon into Canada's expanding marine protected and conserved area network.

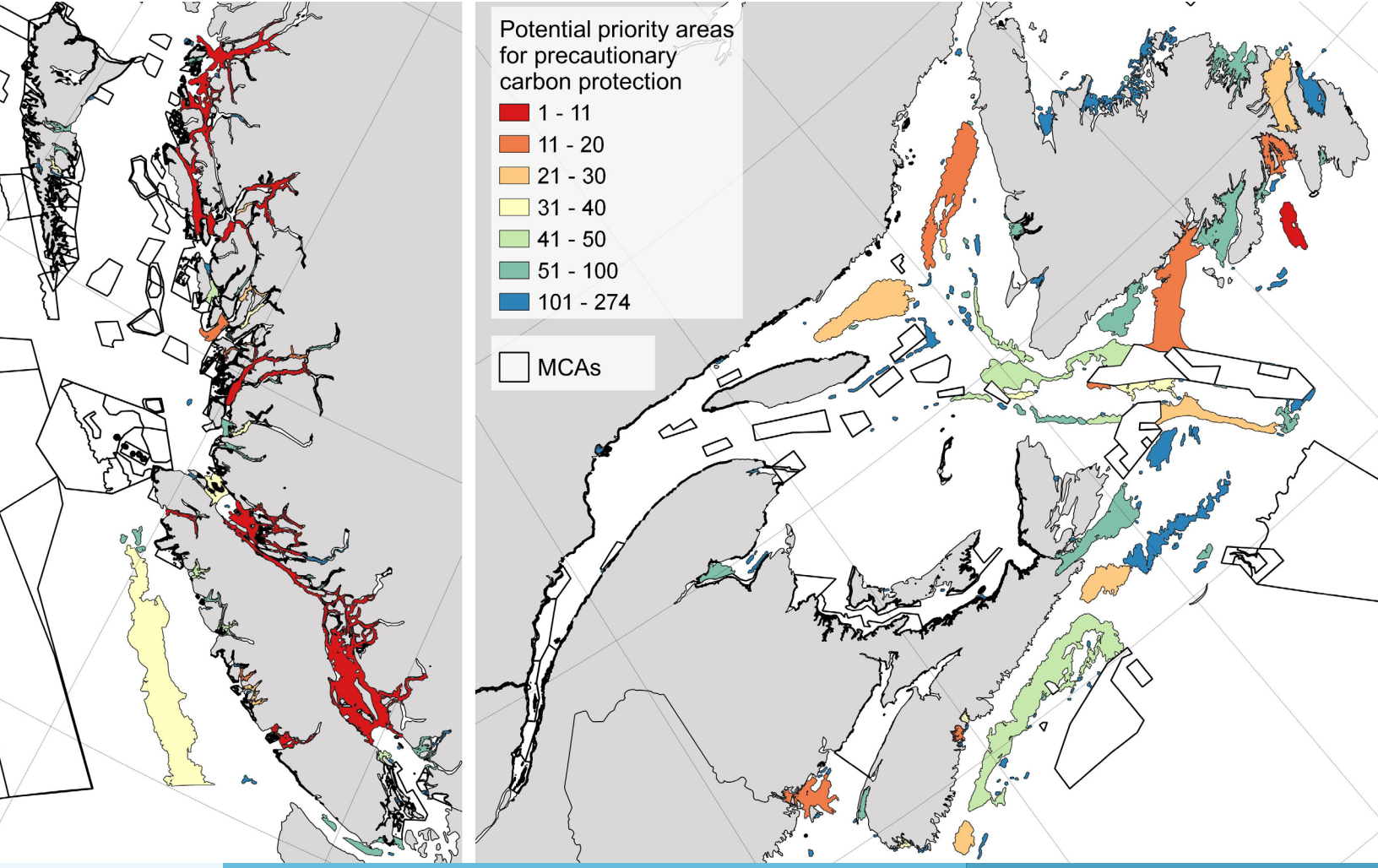
While Canada's unvegetated seabed sediments generally have lower carbon stocks and accumulation rates per-unit-area when compared to coastal vegetated blue carbon habitats, seabed sediments can have similar or even higher stocks and accumulation rates in some areas. Further, unvegetated seabed sediments make up the majority of Canada's marine area, whereas vegetated habitats cover only ~0.1%[3,4]. **Seabed sediments are therefore estimated to represent a carbon store around 100 times that of all of Canada's saltmarsh, seagrass and kelp combined.**

For an MCA designation to have climate change mitigation benefits, it must lead to a reduction in the loss of carbon stocks and/or an increase in carbon accumulation.

There is mounting evidence that human activities are impacting seabed sediment carbon, which is potentially limiting future accumulation, depleting carbon stocks and causing emissions of CO_2[5,6]. While calculating the net carbon benefit from protecting seabed sediments remains highly uncertain and requires further research[5], there are many similar uncertainties for vegetated blue carbon habitats.

Current and proposed MCAs encompass only 20% of the total carbon stocks and carbon-rich seabed areas on Canada's continental margin. Potential priority seabed areas outside of these MCAs were identified based on their estimated seabed carbon stocks, carbon sensitivity and ecological significance. Highest priority areas in British Columbia include the Queen Charlotte Strait and northern Salish Sea, as well as many of the fjords and inlets on the west coast of Vancouver Island and mainland BC. In the Atlantic, highest priority areas include Placentia, Passamaquoddy, Mahone and Trinity bays, as well as parts of the Laurentian Channel and Scotian Shelf. These high-priority areas present opportunities for further research and potential spatial protection within Canada's expanding MCA network.

Although there is high uncertainty due to a lack of data in many regions, the Canadian Arctic is not predicted to contain particularly carbon-rich areas outside of current or proposed MCAs. Even so, precautionary protection could be considered for seabed sediments estimated to have relatively high carbon densities, such as the Foxe Basin, the Beaufort Shelf and Canadian Arctic fjords, especially as some research suggests that climate change could lead to increased sediment carbon storage in the Arctic and may cause increased human disturbance to the seafloor[7,8].



Future Research Needs & Recommendations:

- Site-specific spatial mapping of seabed sediment habitats, organic carbon stocks, carbon accumulation and burial rates, especially where carbon-rich sediments are predicted to occur.
- Data on the reactivity and vulnerability of organic carbon stocks, as well as the impacts of human pressures on carbon accumulation and burial.
- Local data on intensities of human activities which impact seabed sediments to best target conservation measures and identify the potential for net carbon benefits from designation.
- Incorporating the monitoring of organic carbon stocks and accumulation rates into regular MCA monitoring programs of soft sediments to further justify site designations.

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