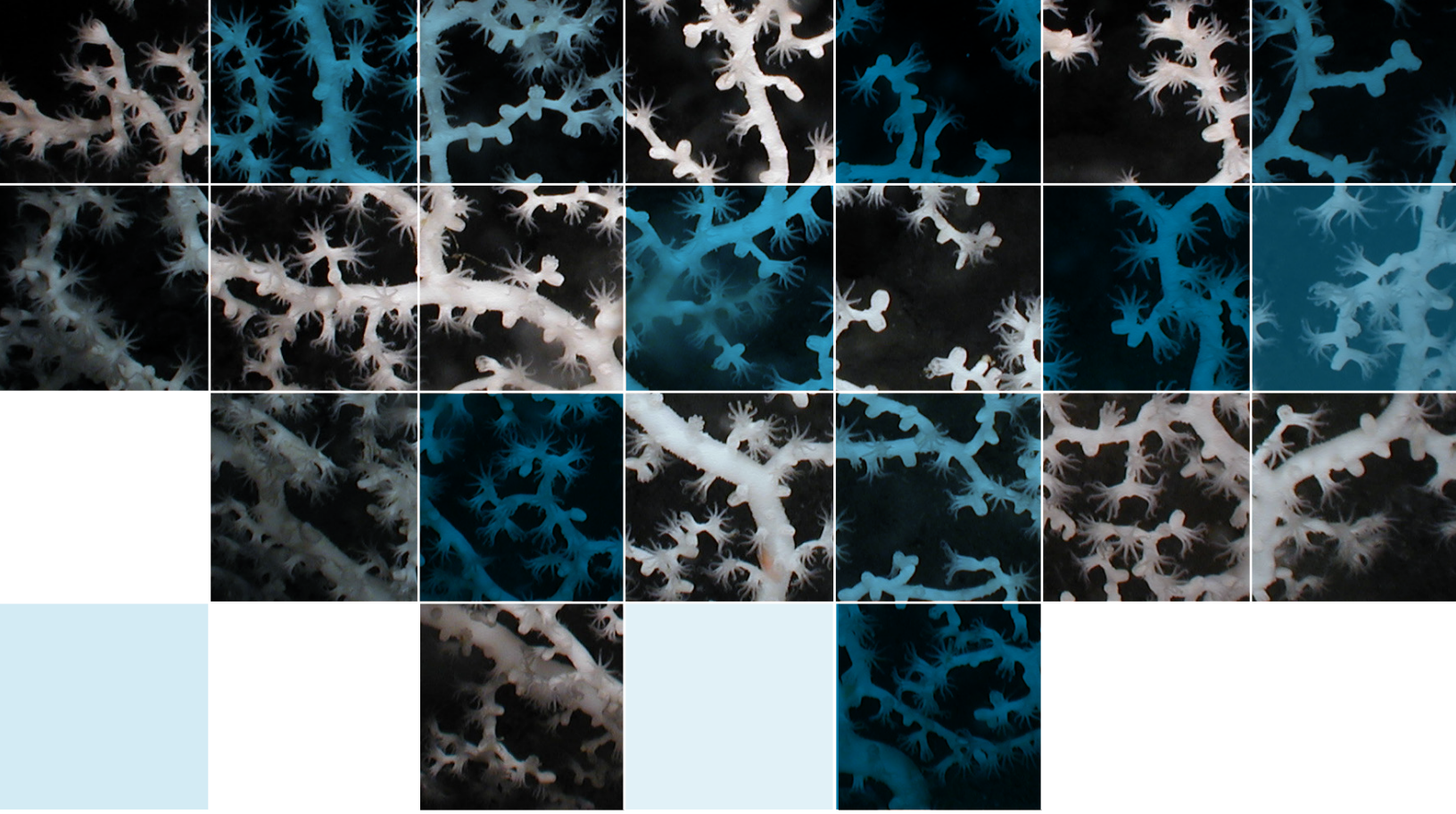


MAPPING CARBON IN CANADA'S SEAFLOOR

How New Maps of Canada's Seabed Carbon Stores Could Inform Management

HIGHLIGHTS

- A new high-resolution predictive map may allow carbon considerations to be incorporated into national and regional seabed planning processes.
- Surficial seabed sediments across Canada's continental margin are estimated to hold 10.9 billion tonnes of organic carbon.
- This is approximately 100 times that of all Canadian seagrass beds and saltmarshes combined[1], around half of all carbon in Canada's forest vegetation, and 10% of that in soils.[2]

BLUE CARBON CANADA

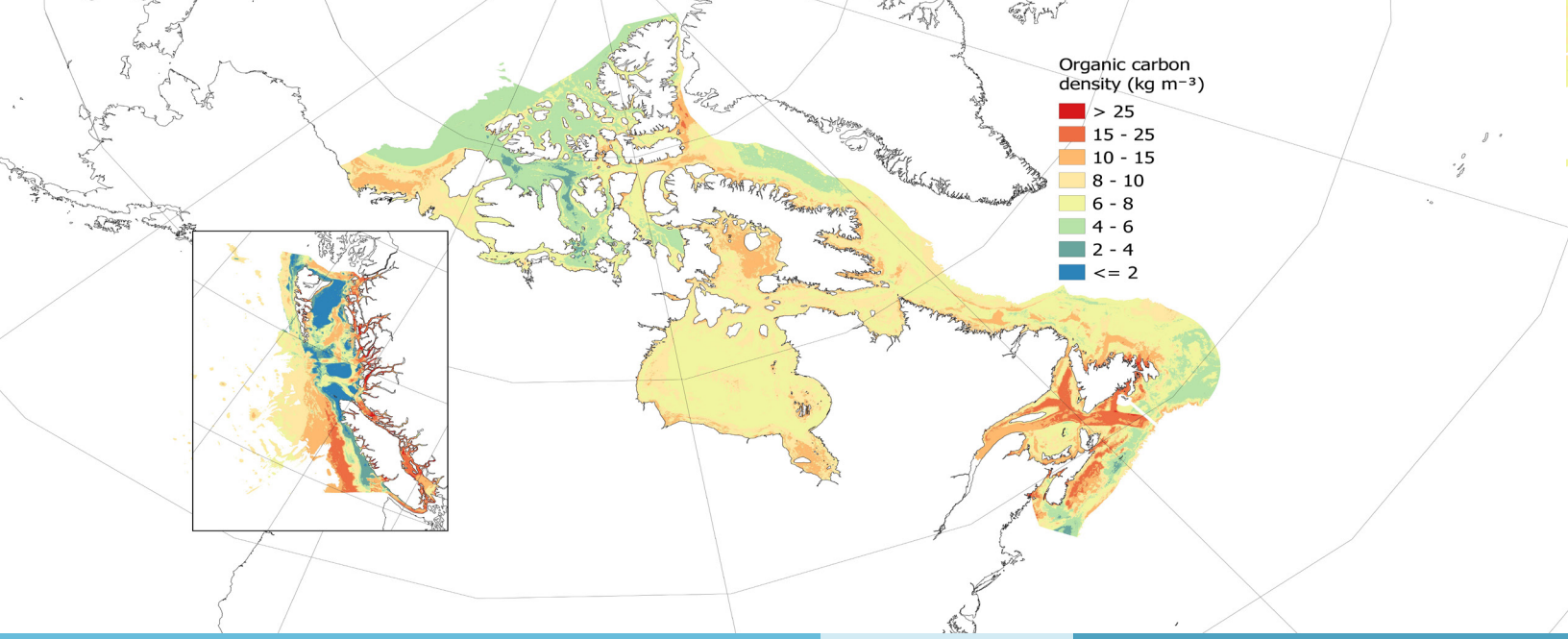
OCEANS NORTH

NSERC CRSNG

mitacs

UVIC

Epstein, G., Fuller, S. D., Hingmire, D., Myers, P. G., Peña, A., Pennelly, C., and Baum, J. K.: Predictive mapping of organic carbon stocks in surficial sediments of the Canadian continental margin, *Earth Syst. Sci. Data*, 16, 2165–2195, https://doi.org/10.5194/essd-16-2165-2024, 2024.



Globally, seafloor sediments are estimated to hold carbon stores greater than that of all soils on land.[3] However, while management plans for coastal and terrestrial areas such as forests and wetlands often account for their role in mitigating climate change[4], much less attention has been paid to the seafloor—in part because less information has been available.

One of the first steps towards including climate change mitigation considerations in national or regional seafloor management plans is to quantify and map this major carbon store. A new study has now produced the highest-resolution map to date of predicted carbon stocks on the Canadian seafloor, which could help inform management of this critical but often overlooked ecosystem.

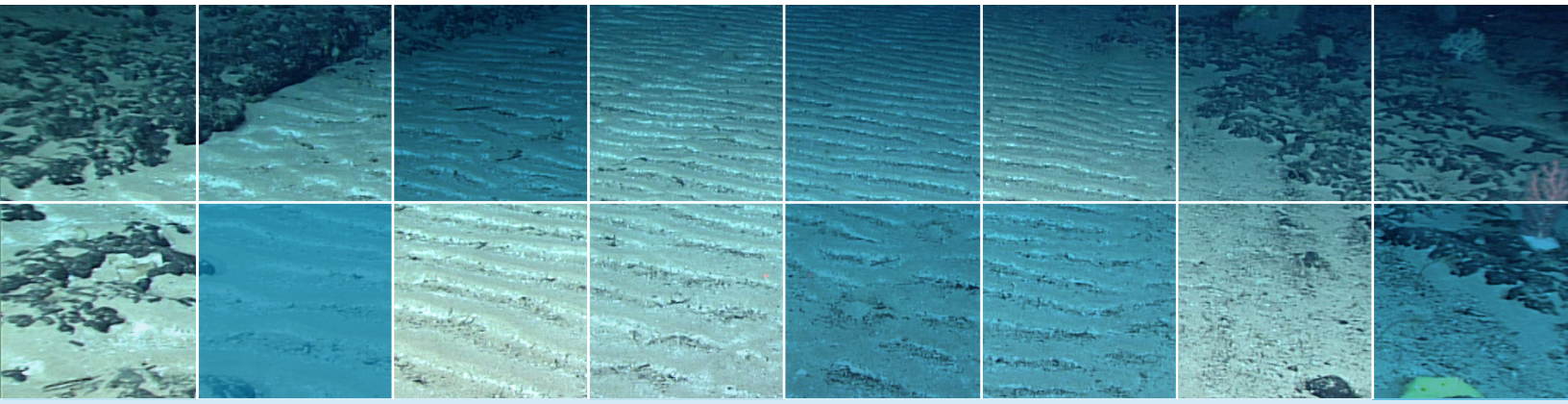
The organic carbon contained in seafloor sediments has a major influence on global carbon cycles and earth's climate. Data from recent global studies have estimated that Canada holds approximately 2.3% of seabed sediment carbon stocks covering around 1.3% of the global ocean[3,5]. However, these modelled estimates are at coarse spatial resolutions, have incomplete coverage, and contain very limited data from within Canada. It is therefore likely that these global distribution estimates are inaccurate at smaller spatial scales and a national approach is needed.

This new study reports on the creation of the first high-resolution predictive map of organic carbon stocks in surficial seabed sediments across the Canadian continental margin.

Using a systematic review of best available data, the authors use a machine learning predictive mapping process to construct a national seabed carbon map. The 200-meter resolution map covers 4,489,235 km2 which is 78.4% of Canada's total marine area or 92.6% of the seafloor area above 2,500 m. The standing stock of organic carbon in the top 30 cm of sediment is estimated to be 10.9 gigatonnes (uncertainty range of 7.0 – 16.0 Gt). The areas with highest carbon density were small areas within nearshore zones, including the inlets and fjords of British Columbia and parts of the Salish Sea, as well as enclosed nearshore areas of the Atlantic east coast. Relatively high carbon densities were also predicted to occur across wider parts of these areas as well as further offshore in deeper channels or troughs within the Gulf of St Lawrence, the central Scotian Shelf, and at the edge of the continental slope west of Vancouver Island.

There is increasing evidence that human activities are impacting seabed sediment carbon stocks. For example, a recent study estimated that global fishing activities could cause considerable remineralisation of seabed sediment organic carbon stocks back to CO_2, although the validity of the scale of these estimates has been called into question[6,7,8].

The maps produced here may provide opportunities to better research and design appropriate management strategies to limit the potential loss of carbon due to disturbance of the seafloor. While all mapping processes are iterative, and further data could continue to improve these maps, this work provides a basis for incorporating climate change mitigation considerations into future seabed management processes.



Policy Implications:

Carbon sediment information can be used in Canada's marine planning initiatives, from new and existing protected area management and conservation objectives, fisheries management, including re-opening of fisheries that are conducted with bottom trawl gear, and for new activities such as planning for offshore renewable energy sites. As Canada evolves its ocean and climate policy framework, our research provides an important factor to be used in decision making.

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