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28 - The Antarctic Benthos - Environmental drivers and ecosystem dynamics

Antarctic Macroalgae: Applying Species Distribution Models to estimate Blue Carbon standing stocks

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The West Antarctic Peninsula has been identified as highly vulnerable due to rising temperatures and increased anthropogenic carbon emissions impacting its biodiversity. Glacier retreat is one of the identified responses, opening up newly ice-free areas available for colonization but also changing the environmental conditions due to meltwater input, sediment runoff, and ice impact. A habitat is characterized by the combination of environmental parameters that support carbon cycling within a specific blue carbon ecosystem, such as macroalgal forests. Species Distribution Models (SDMs) are an efficient tool to link environmental parameters with species presence/absence to identify their habitat suitability and distribution. What if the tool allows us more? We aim to potential carbon standing stock expansion in the ice-free areas opened over the last six decades of glacial retreat in an Antarctic fjord ecosystem, based on the determination of habitat suitability of macroalgae species. This study focuses on the SDMs Chlorophyta, Rhodophyta, and five Phaeophyceae species, projecting macroalgae habitat suitability by species-specific ensemble modeling in the Potter Cove fjord. Further estimations of macroalgal expansion and colonization, as well as potential carbon stocks, were conducted through SDMs results, binary transformation, data from published in-situ abundance quadrat surveys, and conversion factors. From 1956 to 2020 Fourcade Glacier opened up ~1,6 km² free of ice. Our estimation of macroalgal colonization during this period at Potter Cove shows an expansion of ~0.42 km² with a total carbon standing stock of 9.73 ± 6.32 tons of C. Through the integration of SDMs and field data, this research provides valuable insights into the dynamic relationship between Antarctic macroalgae, environmental changes, and carbon stocks, contributing to the broader understanding of ecosystem dynamics in the face of global climate change.