

Assessing Climate-Induced Species Range Shifts and Their Impacts on the Protected Seascape on Canada's East Coast Using Species Distribution Models and Future Projections

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Abstract : Marine protected areas (MPAs) within Canada's exclusive economic zone help ensure the conservation and sustainability of marine ecosystems and the continued provision of ecosystem services to society (e.g., food, carbon sequestration). With ongoing and accelerating climate change, however, MPAs may become undermined in terms of their effectiveness at fulfilling these outcomes. Many populations of species, especially those at their thermal range limits, may shift to cooler waters or become extirpated due to climate change, resulting in new species compositions and ecological interactions within static MPA boundaries. While Canadian MPA management follows international guidelines for marine conservation, no consistent approach exists for adapting MPA networks to climate change and the resulting altered ecosystem conditions. To fill this gap, projected climate-driven shifts in species distributions on Canada's east coast were analyzed to identify when native species emigrate and novel species immigrate within the network and how high mitigation and carbon emission scenarios influence these timelines. Indicators of the ecological changes caused by these species' shifts in the biological community were also developed. Overall, our research provides projections of climate change impacts and helps to guide adaptive management responses within the Canadian east coast MPA network.

Keywords : climate change, ecosystem modeling, marine protected areas, management

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