Marine Biological Hotspots: Ecosystem Services and Susceptibility to Climate Change

Summary

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Living, harvestable resources in the upper Arctic Ocean ultimately depend on the production of marine microalgae. Microalgal production also mitigates global warming by fixing the greenhouse gas CO2 into biomass, of which a portion sinks to the seafloor. This process, called the 'biological CO2 pump', supplies food to the benthic organisms living at the bottom. Ongoing alterations of the physical environment will have profound impacts on the growth conditions of primary producers, affecting the timing, productivity and spatial extent of biological hotspots (i.e. areas of elevated food web productivity against the low background typical of the Canadian Arctic). This project investigates how changes in the dynamics of sea-ice and glacial ice (icebergs and ice islands), water temperature, ocean circulation and wind forcing affect primary production in the upper water column and the benthic ecosystem underneath. Specific objectives are to 1) locate biological hotspots (and coldspots) of pelagic and benthic activity, 2) assess how they function and interact, and 3) assess how their productivity and biodiversity is likely to respond to further perturbations of the environment. To do so, we are and have been developing and implementing cutting-edge observational and experimental approaches that exploit remote sensing from space, autonomous underwater vehicles as well as the sampling and laboratory facilities of the CCGS Amundsen. Our work is done in very close collaboration with several ArcticNet projects, collaborators and partners from government and the industry.

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