Climate change is a pressing issue to Greenland, a land 80% covered by ice with winter sea ice covering most of its surrounding seas. Sea ice retreat represents both a threat to existing ice-dependent communities and an economic opportunity from expanded access to ice-free seas. Greenland is heavily dependent upon marine resources; with fishing accounting for almost 90% of all exports. The largest fishery is the West Greenland Coldwater Prawn Fishery with annual catches of c.100kt. Over the last decade prawn stocks have reduced in the south and increased in the north driven by warming sea temperatures.

Coldwater prawn habitats in Greenland are mainly 200-500m depth covering much of the continental shelf out to 200km offshore. The seabed of the prawn habitats are sediment rich and receive organic detritus from coastal ecosystems, phytoplankton, faecal pellets and the fall of dead organisms. The coldwater prawn represents a huge biomass moving up and down the water column on a diurnal cycle, transporting substantial amounts of organic matter from pelagic to benthic zones.

Many benthic habitats are dominated by filter feeding organisms such as corals, sponges and anemones that are dependent on falling organic matter for food, including that provided by the prawns. Our knowledge of benthic habitats around Greenland is limited by the difficulties of surveying both the Arctic and the deep sea. We do know that important habitat-forming organisms occur in the area, and that these play critical ecological roles in the marine environment, including providing habitats to commercially important fisheries. These habitats are also impacted by climate change.

In light of the many threats caused by climate change, there is a growing interest in the value of deep-sea habitats as carbon sinks. Improving our understanding of the coldwater prawn ecosystem will help us assess its blue carbon value, while assessing the impact of climate change on these habitats will enable more effective marine resource management. Outputs from this project could help inform how similar habitats elsewhere in the Arctic may be affected by climate change.

This project will expand our knowledge of ecosystem functioning and carbon cycling in Greenland’s prawn habitats by:

i) Using existing and novel benthic camera surveys to document, describe & map benthic cold water prawn habitats

ii) Modelling the impact of prawn diurnal migration to flows of carbon and the biological pump

iii) Coupling this model with direct observations of marine snow fall and total organic carbon of sediments

iv) Examining the influence of environmental factors such as sea temperature, sediment type, ice cover and particulate organic carbon in the distribution of coldwater prawns and their preferred benthic habitats

v) Using predictions of change in sea temperatures & ice cover to assess the consequences for coldwater prawns, their preferred benthic habitats and the implications for their ecosystem services.

Links:
https://www.zsl.org/greenland,
https://www.frontiersin.org/articles/10.3389/fmars.2020.00460/full,
https://doi.org/10.1016/j.ecss.2022.108087,
https://dx.doi.org/10.1093/icesjms/fs206

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