

Multi-component approach to marine food webs in Inglefield Bredning coastal ecosystems, northwestern Greenland

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Coastal environments in the Arctic are rapidly changing under the influence of a warming climate, which has been particularly intense in Greenland. Changes in these environments are likely to affect interactions existing between organisms and underlying ecosystem processes, which in turn may severely impact human societies that depend on local marine resources (Sugiyama et al. 2021). In the frame of the ArCS (Arctic Challenge for Sustainability) Project II, we conducted summer field research in northwestern Greenland in 2022 and 2023. Our objectives were to examine the structure and functioning of coastal marine ecosystems, to better understand changes occurring in these coastal environments, and their potential to affect local peoples' livelihood. In partnership with local hunters and fishermen/women, small boats were used to access fjords, bays and glaciers near the villages of Qaanaaq, Siorapaluk and Qeqertat (Fig. 1). Oceanographic stations were repeated along environmental gradients, revealing a clear horizontal (geographic) structuring of planktonic communities in response to physical oceanography, under the influence of tidewater glacier meltwater and river runoff. In addition, echograms collected from year-long moorings highlighted dynamic vertical (depth-wise) diel migrations of these marine communities, which were season-specific. Secondary consumers and top predators seemed to tightly respond to both of these structural patterns. In each surveyed area, the bird community composition was spatially structured at sea according to the surface oceanographic characteristics. The bird activity measured at globally-significant little auk colonies through sound pressure levels indicated that these plankton feeders also responded closely to diel vertical migrations of their prey. The importance of polar cod (a marine bio-indicator species in the context of warming in the Arctic) in the diet of predators such as Arctic char was also noted. Stomach contents from birds and marine mammal species typically consumed by the villagers were examined and found to contain macro-plastics. Across the predator community, stable isotope analysis highlighted a clear relationship between trophic level and mercury contamination, although levels of contamination also varied according to the animals' age and breeding status. This research shows the interactions and cascading effects existing between ecosystem components in a coastal region under the influence of a rapidly warming Arctic, with local human livelihood and public health at stake. This presentation will show a broad overview of the results obtained across fields involved in this program, and provide key synthetic messages and list the needs for future research.

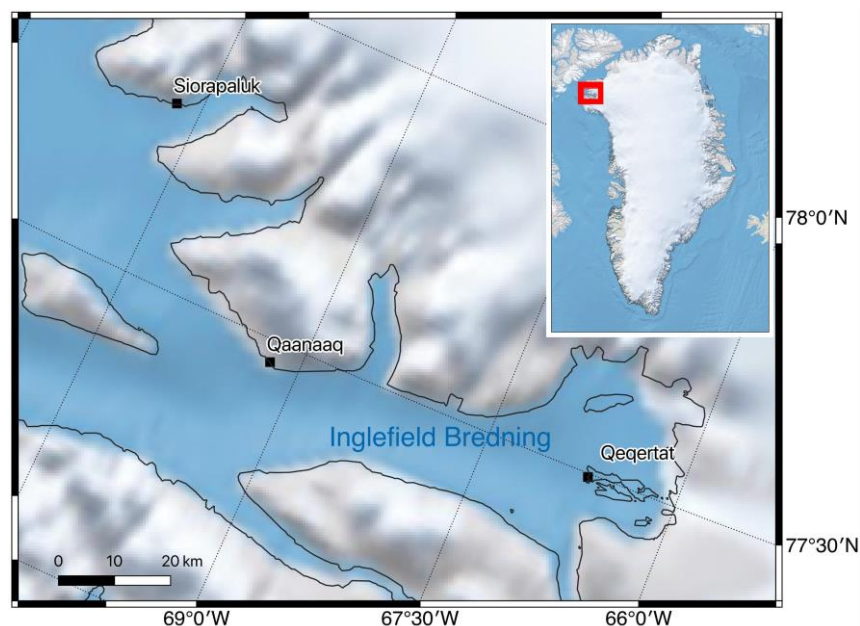


Figure 1. Location of the studied area in northwestern Greenland.

References

Sugiyama, S., Kanna, N., Sakakibara, D., Ando, T., Asaji, I., Kondo, K., Wang, Y., Fujishi, Y., Fukumoto, S., Podolskiy, E. et al., Rapidly changing glaciers, ocean and coastal environments, and their impact on human society in the Qaanaaq region, northwestern Greenland, *Polar Science* 27, 100632, 2021.