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TITLE: Ecosystem characteristics and processes facilitating persistent macrobenthic biomass hotspots and associated benthivory in the Pacific Arctic

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ABSTRACT:

The northern Bering and Chukchi Seas are areas in the Pacific Arctic characterized by high northward advection of Pacific Ocean water, with seasonal variability in sea ice cover, water mass characteristics, and benthic processes. In this review, we evaluate the biological and environmental factors that support communities of benthic prey on the continental shelves, with a focus on four macrofaunal biomass ?hotspots.? For the purpose of this study, we define hotspots as macrofaunal benthic communities with high biomass that support a corresponding ecological guild of benthivorous seabird and marine mammal populations. These four benthic hotspots are regions within the influence of the St. Lawrence Island Polynya (SLIP), the Chirikov Basin between St. Lawrence Island and Bering Strait (Chirikov), north of Bering Strait in the southeast Chukchi Sea (SECS), and in the northeast Chukchi Sea (NECS). Detailed benthic macrofaunal sampling indicates that these hotspot regions have been persistent over four decades of sampling due to annual reoccurrence of seasonally consistent, moderate-to-high water column production with significant export of carbon to the underlying sediments. We also evaluate the usage of the four benthic hotspot regions by benthic prey consumers to illuminate predator?prey connectivity. In the SLIP hotspot, spectacled eiders and walrus are important winter consumers of infaunal bivalves and polychaetes, along with epibenthic gastropods and crabs. In the Chirikov hotspot, gray whales have historically been the largest summer consumers of benthic macrofauna, primarily feeding on amphipods in the summer, but they are also foraging further northward in the SECS and NECS hotspots. Areas of concentrated walrus foraging occur in the SLIP hotspot in winter and early spring, the NECS hotspot in summer, and the SECS hotspot in fall. Bottom up forcing by hydrography and food supply to the benthos influences persistence and composition of benthic prey that then influences the distributions of benthivorous upper trophic level populations.

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