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THE DISTRIBUTED BIOLOGICAL OBSERVATORY: A LATITUDINAL DETECTION ARRAY FOR TRACKING ECOSYSTEM CHANGE IN THE PACIFIC ARCTIC

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Seasonal sea ice conditions and seawater temperatures strongly influence biological processes and marine ecosystems at high latitudes. In the Pacific Arctic, localized and persistent areas with high benthic macroinfaunal biomass, termed “benthic hot spots”, have been documented over four decades. These regions are now being more consistently sampled to relate changes in seasonal sea ice retreat and physical forcing to ecosystem response in both the water column and sediments through an Arctic Distributed Biological Observatory (DBO). DBO sampling is conducted through a series of international cruises that undertake standard sampling along set latitudinal transect lines and/or within regional bounding boxes through coordination with the Pacific Arctic Group, a consortium of scientists from Canada, China, Japan, Republic of Korea, Russia and the United States. These hotspot sites are important foraging areas for upper trophic level benthic and pelagic feeders, such as marine mammals and seabirds. South of St. Lawrence Island (SLI) in the northern Bering Sea, benthic feeding spectacled eiders, bearded seals and walrus are important winter consumers of infauna, such as bivalves and polychaetes, with bowheads feeding on zooplankton prior to their transit north. Gray whales have historically been a major summer consumer of benthic amphipods in the Chirikov Basin north of SLI, although summertime sightings of gray whales declined in the Chirikov Basin from the 1980s up until at least 2002. The SE Chukchi Sea hotspot, similar to the other DBO sites, is maintained by high chlorophyll *a* that is produced locally as well as advected by water masses flowing northward through Bering Strait. Both walrus and gray whales are known to forage in this hotspot seasonally on the high biomass of benthic prey, with sightings of humpback and fin whales feeding on pelagic prey now common in late summer. In the NE Chukchi Sea, clams, polychaetes and sipunculids that are important prey for walrus and bearded seals dominate at this benthic hotspot. Finally, the upper Barrow Canyon hotspot is dominated by a high diversity of mussels, polychaetes, and soft corals, with canyon dynamics being an important forcing function for maintaining productivity at this site. This area is also a focal feeding area for bowhead whales, with gray whales usually feeding closer to shore. Notably the center of the highest benthic biomass regions has shifted northward in the three southern DBO hotspots in recent years. This finding has coincided with changing sediment grain size, an indicator of current speed, and these shifts are also likely responses to changes in primary production in the region. The DBO incorporates a series of coordinated, multi-trophic level observations that integrate physical, biogeochemical and biological measurements. This presentation will highlight results from the international DBO time-series sites in relation to retrospective and ongoing process-oriented studies in the Pacific Arctic region.