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**The Distributed Biological Observatory (DBO):
A Change Detection Array in the Pacific Arctic Sector**

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The Pacific sector of the Arctic Ocean is experiencing major reductions in seasonal sea ice extent and increases in sea surface temperatures. One of the key uncertainties in this region is how the marine ecosystem will respond to seasonal shifts in the timing of spring sea ice retreat and/or delays in fall sea ice formation. Variations in upper ocean water hydrography, planktonic production, pelagic-benthic coupling and sediment carbon cycling are all influenced by sea ice and temperature changes. Climate changes are likely to result in shifts in species composition and abundance, northward range expansions, and changes in lower trophic level productivity that can directly cascade and affect the life cycles of higher trophic level organisms.

Several regionally critical marine sites in the Pacific Arctic sector that have very high biomass and are focused foraging points for apex predators have been re-occupied during multiple international cruises. The data documenting the importance of these ecosystem “hotspots” provide a growing marine time-series from the northern Bering Sea to Barrow Canyon at the boundary of the Chukchi and Beaufort seas. Results from these studies show spatial changes in carbon production and export to the sediments as indicated by infaunal community composition and biomass, shifts in sediment grain size on a S-to-N latitudinal gradient, and range extensions for lower trophic levels and further northward migration of higher trophic organisms, such as gray whales. There is also direct evidence of negative impacts on ice dependent species, such as walrus and polar bears. To more systematically track the broad biological response to sea ice retreat and associated environmental change, an international consortium of scientists are developing a “Distributed Biological Observatory” (DBO) that include selected biological measurements at multiple trophic levels. The DBO currently focuses on five regional biological “hotspot” locations along a latitudinal gradient. Hydrographic transects occupied from spring to fall in 2010 and 2011 at two pilot sites in the SE Chukchi Sea and Barrow Canyon, provide repeat collections of water parameters over the seasons that are unavailable from single cruises. This sampling indicates freshening and warming as Pacific seawater transits northward over the spring to fall season, with impacts on both plankton and benthic prey bases for larger marine mammals and seabirds. The intent of the DBO is to serve as a change detection array for the identification and consistent monitoring of biophysical responses. This network of spatially explicit DBOs is being organized through the Pacific Arctic Group (PAG), a collaborative network endorsed by the International Arctic Science Committee. Our presentation will provide new information to evaluate the status and developing trends of the marine biological system as it responds to the rapid environmental change.