

Increasing Zooplankton Biomass Associated with Sea Ice Loss in the Western Arctic Ocean

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Sea ice cover is rapidly declining due to global warming accompanied by sea surface temperature warming and an increase in phytoplankton primary production in the western Arctic Ocean. Although these trends are well documented, their influences on marine ecosystems remain unclear because few studies have conducted long-term ecological monitoring at decadal time scales. Using mooring-based acoustic backscattering data collected during periods of both high (2000-2003) and low sea ice coverage (2010-2013) in the Chukchi Sea, western Arctic Ocean, we show that the annual mean zooplankton biomass increased 1.6-fold between the two periods. This biomass change would have increased the grazing pressure on phytoplankton by zooplankton, which, in turn, decreased the supply of sinking carbon to benthic organisms during summer, even though phytoplankton production would have increased. Thus, the Chukchi Sea ecosystem is now shifting away from a pelagic-benthic coupled ecosystem towards one that is pelagic-dominated, in which the primary production is not directly connected to the benthic carbon cycle due to increased pelagic zooplankton grazing.

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