

Inter-annual variation of summer zooplankton community in the Chukchi Sea: spatial heterogeneity during a decade of rapid ice retreat

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Abstract: Global warming can lead zooplankton to changes in distribution, abundance or composition. To evaluate the response of the Chukchi Sea communities, we combined zooplankton samples collected in summer of 2003, 2008, 2010 and 2012, and investigated the inter-annual changes in regions with various physical and biological characters. Three geographically separated communities were identified by hierarchical cluster analysis, including the north Chukchi Sea community (NCS) governed by Arctic cold water and the Bering Sea water influenced central (CCS) and south (SCS) Chukchi Sea community. Zooplankton abundance was low in NCS and dominated by copepods (>90%). It was about ten times higher in CCS and SCS, co-dominated by copepods and barnacle larvae (86-98%). In the NCS community, similar dominant species were recorded in 2003 and 2008, but total abundance increased from 118.9 to 182.5 ind/m³. Average zooplankton abundance of all Pacific-influenced stations increased from 2003 to 2012, but lowest average abundance was observed in 2012 and 2010 in the CCS and SCS community, respectively. Barnacle larvae, *Calanus glacialis*, *Pseudocalanus* spp., and *Oikopleura vanhoeffeni* were identified as dominant species of the CCS community, and those for the SCS community included also *Eucalanus bungii* with Pacific origin, as well as *Acartia longiremis*, *Obelia longissima* and other merozooplankton commonly observed in neritic waters. Numerical increase was observed only in *C. glacialis*. We

propose spatial heterogeneity for zooplankton community changes in response to global warming. Numerical increase is expected in Arctic waters with constant structure, and inter-annual variability in composition is also significant in shallow waters receiving Pacific inflows.

Keywords: climate change; ecological consequence; composition; geographical distribution; species invasion; dominance index