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Spatial and geographical changes in the mesozooplankton community in the Bering and Chukchi Seas during the summers of 2007 and 2008

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ABSTRACT

From July to August 2007 and June to July 2008, the horizontal/geographical changes in the zooplankton community in the Bering and Chukchi Seas were studied. The geographical patterns, which were common for these two years, were observed for salinity, chlorophyll *a* (Chl. *a*), zooplankton chaetognaths, hydrozoans and the whole zooplankton community. Among them, the patterns of salinity and Chl. *a* were related with the horizontal distribution of the water masses. The distributions of the two carnivorous taxa were correlated with their prey (copepods or barnacle larvae). The analysis of the structural equation model (SEM) revealed that the horizontal distribution of the zooplankton abundance and biomass were governed by the different taxa. Thus, the zooplankton abundance was governed by the numerically dominant but smaller-bodied taxa, such as the barnacle larvae and copepod *Pseudocalanus* spp., while the zooplankton biomass was determined by the large-bodied copepods, such as *Calanus glacialis/marshallae* and *Eucalanus bungii*.

1. Introduction

In the Chukchi Sea, located in the Pacific sector of the Arctic Ocean, under the recent climate changes, the sea ice is melting faster (Markus et al., 2009) and the primary production is increasing (Arrigo et al., 2014). Concerning the zooplankton, extensions of the distribution range of the sub-Arctic (Bering Sea) fauna to the Arctic Chukchi Sea were reported under the effect of the inflow of Pacific Water (Matsuno et al., 2011; Nelson et al., 2014). Because the climate-induced changes in the zooplankton community in this region occurred in conjunction with the oscillation of the horizontal distribution of the community, information regarding the horizontal/geographical distribution of the zooplankton community in the Bering and Chukchi Seas is of primary importance.

Previously, the zooplankton communities in the Bering Sea and Chukchi Sea were studied independently. For instance, in the Bering Sea, various projects, such as the Bering Ecosystem Study (BEST) and Bering Sea Integrated Ecosystem Research Program (BSIERP), were performed (Stabeno et al., 2012; Eisner et al., 2014). For the Chukchi Sea, the zooplankton studies were conducted with comparable programs, such as the Russian-American Long-term Census of the Arctic (RUSALCA) and the Chukchi Acoustic, Oceanographic and Zooplankton (CHAOZ) study (Hopcroft et al., 2010; Questel et al., 2013). Because these projects were conducted independently in the Bering Sea and Chukchi Sea, little information is available for the horizontal distribution of the zooplankton community more broadly throughout the two regions (cf. Pomerleau et al., 2014).

In the present study, we evaluated the horizontal/geographical distribution of the zooplankton community in the Bering and Chukchi Seas from July to August in 2007 and June to July in 2008 based on the samples collected using the same methods in each location. To identify the governing factors of zooplankton abundance and biomass in this region, we conducted a structural

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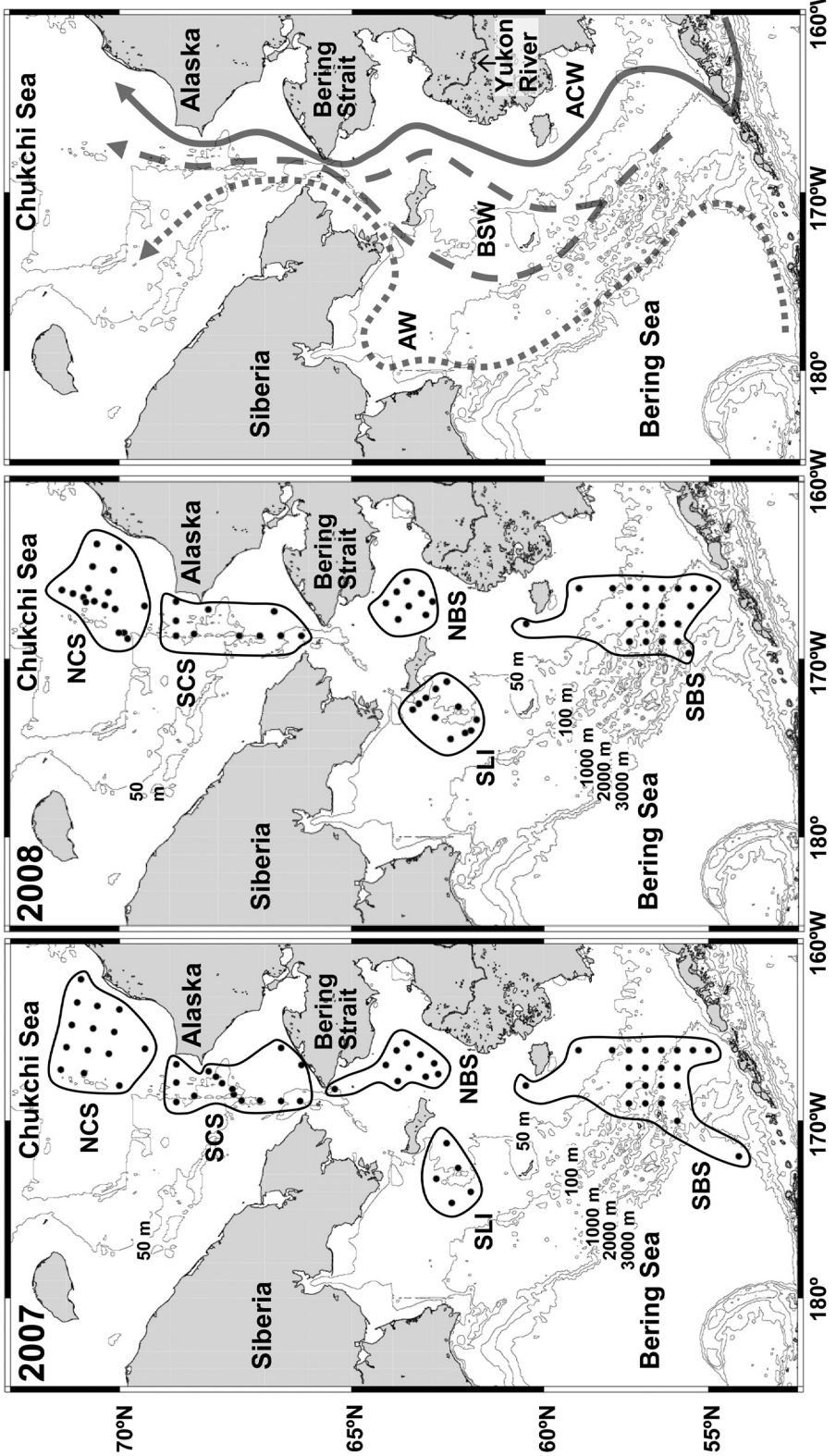

Fig. 1. Location of the sampling stations in the Bering and Chukchi Seas from June to August of 2007 and 2008. Symbols denote stations where the samplings were conducted. Depth contours (50, 100, 1000, 2000 and 3000 m) are superimposed. Based on geographical distribution, the stations are grouped into five regions: southern Bering Sea (SBS), around St. Lawrence Island (SLI), northern Bering Sea (NBS), southern Chukchi Sea (SCS) and northern Chukchi Sea (NCS). For the right panel, arrows indicate the approximate current flows. ACW: Alaskan Coastal Water, BSW: Bering Shelf Water, AW: Anadyr Water.

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