Bacterial Biogeography Influenced by Shelf-Basin Interaction in the Arctic Seafloor

Dukki Han[1], Seung-Il Nam[2], Ho Kyung Ha[3], Hyoungjun Kim[2], Michael J. Sadowsky[4], Yoo Kyung Lee[2], and Hor-Gil Hur[1]

[1]School of Environmental Science and Engineering, Gwangju Institute of Science and Technology, Gwangju 500-712, Republic of Korea; [2]Korea Polar Research Institute, Incheon 406-840, Republic of Korea; [3]Department of Ocean Sciences, Inha University, Incheon 402-751, Republic of Korea; [4]Department of Soil, Water, and Climate, Biotechnology Institute, and Microbial Plant and Genomics Institute, University of Minnesota, St. Paul, MN 55108, USA

Arctic seawater consists of distinctive water masses (surface mixed layer, Pacific, and Atlantic waters) that may partially intermix on the shelves around the Arctic basin as a consequence of shelf-basin exchange caused by very dense brine-enriched waters. In the current study, we found that bacterial assemblage of the surface sediment was different from that of seawater while seawater harbored local bacterial assemblages in response to the Arctic hydrography. This finding suggests that the Arctic seafloor may have distinctive bacterial biogeography. Moreover, the distribution of bacterial assemblages and physicochemical properties in surface sediments in the western Arctic changed gradually from continental shelf to deep-sea basin. This suggests that the bacterial biogeography within surface sediments may be influenced by an oceanographic trait linked to Arctic sedimentation. Indeed, oceanographic studies have implied sediment gravity flows can transport sediment particles on the seafloor, which affects the variability of sedimentation in the marine environment. We conclude that sediment gravity flows may play a key role for the dispersal of bacterial assemblages on the surface sediments, and oceanographic traits from the continental shelf to deep-sea basin in the western Arctic. The present study offers a deeper understanding of oceanic convection and its role in the construction of bacterial assemblages and the relationship between microbial distributional patterns and physicochemical properties in the Arctic Ocean.

Keywords: Arctic Ocean, Sediment gravity flow, Bacterial biogeography, Dispersal Limitation