

A01-P18

ECOSYSTEM STUDIES OF THE ARCTIC OCEAN WITH DECLINING SEA ICE

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The recent drastic decrease in Arctic sea ice causes various changes in the Arctic climate and ecosystems. For example, melting of sea ice improves light environment for phytoplankton growth but at the same time it increases surface stratification to suppress nutrient supply from lower layer. The benthic organisms are also threatened by changes in Arctic environments. Currently, they feed on the ice-edge bloom of phytoplankton that sinks to the seafloor (Pelagic-Benthic type). However, warming of the Arctic Ocean may increase the population of zooplanktons and fishes, which will feed on phytoplankton at the ice-edge (Pelagic-Pelagic type). Furthermore, reduction of sea ice also changes habitat distributions for species in the Arctic and sub-Arctic seas. For better understanding changes in Arctic ecosystems, we conduct multi-disciplinary studies examining not only biological but also physical and chemical aspects of the drastically changing Arctic environments.

The research project, “Ecosystem studies on the Arctic Ocean with declining sea ice”, was initiated in 2011 under the GRENE Arctic Climate Change Research Project in Japan (ECOARCS/GRENE). In this project, we focus on the Pacific side of the Arctic and sub-Arctic seas, where various environmental changes have already accompanied the sea ice reduction. Hydrographic surveys by R/V Mirai (JAMSTEC), TS Oshoro Maru (Hokkaido University), and various ice-breakers under international collaboration are carried out. In addition, we conduct year-round mooring observations that are useful for obtaining hydrographic, chemical and biological data even in winter time. To clarify the feeding behavior of higher trophic levels, we also use the techniques of bio-logging and monitor large areas of the Arctic Ocean via satellite throughout the year. Furthermore, we are developing marine ecosystem models for the Arctic Ocean that can diagnose in detail the ongoing changes in the Arctic marine ecosystem and may predict its future.



Schematics of the project “Ecosystem studies on the Arctic Ocean with declining sea ice”