

【Grant-in-Aid for Scientific Research (S)】

Integrated Disciplines (Environmental Science)



Title of Project: Plankton in Polar Regions—toward an Understanding of their Characteristics

Naomi Harada

(Japan Agency for Marine-Earth Science and Technology, Research & Development Center for Global Change, Deputy Director of R&D Center)

Research Project Number: 15H05712 Researcher Number : 70344281

Research Area: Environmental Science

Keyword: Marine biology, Arctic Ocean, Ocean Acidification

【Purpose and Background of the Research】

The decline of biodiversity (the biomass, composition, and distribution of species) on Earth reflects the fact that the ability of Earth to sustain biodiversity in a dynamic environment has been seriously compromised by environmental stressors such as climate change and ocean acidification. Furthermore, the reduction of sea ice in the Arctic Ocean, which has progressed more rapidly than previously predicted, could exacerbate several environmental stresses, including ocean warming, acidification, and stratification. How do marine organisms in polar regions respond to ocean warming and acidification? This study focuses on phytoplankton and zooplankton, which constitute the base of the food chain in the Arctic Ocean. The goals of the research are to understand 1) the influence of ocean acidification on calcifiers; 2) the warming-associated changes of the biomasses of major and minor species; and 3) the specific functions of plankton that live in the Arctic.

【Research Methods】

The target area of this study is the western Arctic Ocean, where the reduction of sea ice is especially serious (Fig. 1). A time series sediment trap mooring system will be deployed at Station NAP (75°N, 162°W), a biological hotspot, to collect settling biogenic particles. We will also measure temperature, salinity, dissolved oxygen and

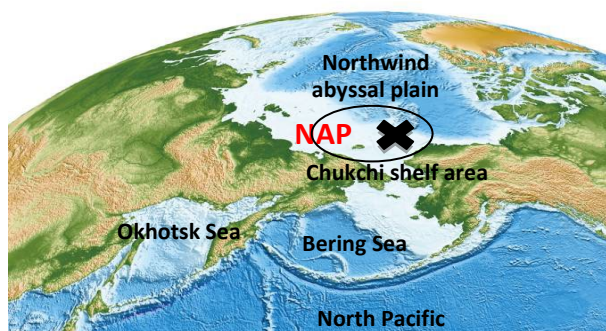


Figure 1. Observation area (black oval) and Station NAP (x), which is where the time series sediment trap mooring system is to be deployed..

nutrient concentrations, and pH by using sensors deployed on the mooring system. The micro X-ray computer tomography technique (MXCT) will be developed to evaluate the impact of ocean acidification on calcifiers. We will analyze the assemblage of settling biogenic particles by using 18S rRNA sequences to detect temporal changes in major and minor species. Whole-genome analyses of specific phytoplankton will reveal how the phytoplankton produce various aliphatic hydrocarbons.

【Expected Research Achievements and Scientific Significance】

Analyses of settling biogenic particles and environmental data at Station NAP will enable us to understand seasonal and annual changes in the composition and biomass of lower-trophic-level organisms in the western Arctic Ocean and their responses to environmental stressors, especially ocean warming and acidification. Because no standard method for quantifying responses of marine organisms to ocean acidification currently exists, then the MXCT technique could become the standard method for evaluating the impact of ocean acidification on marine calcifiers

【Publications Relevant to the Project】

- Watanabe, E. et al. (2014) Enhanced role of eddies in the Arctic marine biological pump, *Nature Comm.*, doi: 10.1038/ncomms4950.
- Onodera, J. et al., (2015) Diatom flux reflects water-mass conditions on the southern Northwind Abyssal Plain, Arctic Ocean. *Biogeosciences*, 12, 1373–1385.

【Term of Project】 FY2015-2019

【Budget Allocation】 151,900 Thousand Yen

【Homepage Address and Other Contact Information】

<http://www.jamstec.go.jp/arctic-eco/>