

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

### Integrated Science and Innovative Science (New multidisciplinary fields)



**Title of Project : Catastrophic reduction of sea-ice in the Arctic Ocean – its impact on the marine ecosystems in the polar region –**

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Research Area : New multidisciplinary fields, Environmental science, Environmental dynamic analysis

Keyword : Environmental monitoring of the polar regions

#### 【Purpose and Background of the Research】

The marine ecosystem surrounding the Arctic Ocean is complicated and difficult to predict the future because “disadvantage” phenomena such as ocean acidification and “advantage” phenomena such as improving light condition for marine organisms, respectively, are simultaneously progressing. The aims of this study are 1) to estimate the recent changes in sea-ice thickness and sea-ice covering area, and temporal changes in primary production, 2) to understand the physiological response of marine phyto- and zooplanktons having carbonate tests on warming or freshening associated with sea-ice melting, 3) to develop a new model for marine ecosystems in the Arctic Ocean, to reproduce the primary production by using the model and to understand the response of marine ecosystems on the catastrophic environmental changes caused by rapid sea-ice reduction (Fig.1: Inside the black circle).

#### 【Research Methods】

This study will be investigated by three groups of observation by research vessel and satellite, culture and breeding of planktons, and marine ecosystem model. The specific research outlines are as follows:

- Estimation of changes in sea-ice thickness and covering area, and water mass structure to understand annual changes in physical oceanographic environment associated with sea-ice expansion or reduction in the Arctic Ocean
- Detection of seasonal and annual changes in primary production and organisms composition
- Understand of changes in physiological response of coccolithophorid and foraminifer on environmental changes caused by sea-ice melting by culture / breeding experiments
- Development of new model for marine ecosystems in the Arctic Ocean based on the NEMURO, which has already been used for the prediction of fish resources in the North Pacific, to reproduce the primary and

secondary production and to predict the distribution area of fish resources.

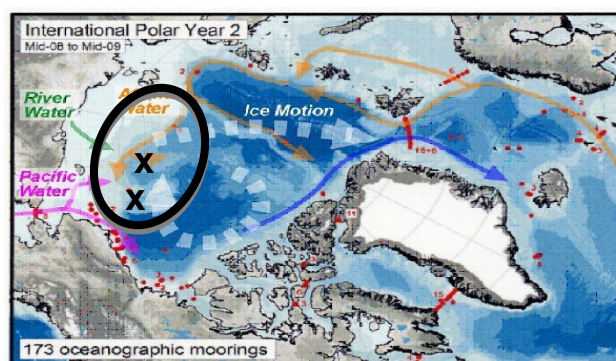


Fig. 1 Location map of observation area (black circle) and deployment sites of sediment trap and physical oceanographic mooring systems (black crosses)

#### 【Expected Research Achievements and Scientific Significance】

It is expected that we can obtain new prediction of marine ecosystems not only low trophic level organisms but also fish resources in this area. The prediction of fish resources in the Arctic Ocean would contribute to the planning of Japanese policy for fisheries.

#### 【Publications Relevant to the Project】

- Nishino, S. et al. (2009) Vertical double silicate maxima in the sea-ice reduction region of the western Arctic Ocean: implications for an enhanced biological pump due to sea-ice reduction. *J. Oceanogr.*, 60, 871–883.
- Yamamoto-Kawai M. et al. (2009) Aragonite undersaturation in the Arctic Ocean: effects of ocean acidification and sea ice melt, *Science*, 326, 1098–1100.

【Term of Project】 FY2010-2014

【Budget Allocation】 152, 300 Thousand Yen

【Homepage Address and Other Contact Information】