SCAR Felloship 2006-07 Report

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Institution visited:
Australian Antarctic Division, Hobart, Australia
Host scientist: Dr. So Kawaguchi

Dates:
March – April, 2008

Overview of activities:
Title:
Impacts of krill on the Antarctic climate change: how do krill affect the DMS distribution in the Southern Ocean?
Objective:
The objective of this study was to examine the effect of feeding krill on DMS dynamics in the seawater.
Methods:
In order to examine the various effects of feeding krill on DMS dynamics, following rates were measured in laboratory;
1. Accumulation rates of DMSPp into krill guts
2. Accumulation rates of DMSPp into the fecal pellets
3. Releasing rates of DMSPd+DMS when krill graze phytoplankotn
4. Releasing rates of DMSPd+DMS by excretion
5. Releasing rates of DMSPd+DMS from fecal pellets

To measure these rates, feeding and egestion experiments of krill and degradation experiments of fecal pellets were conducted. Living krill, *Euphausia superba,* and haptophytes, *Phaeocystis Antarctica,* cultured at laboratories in the Australian Antarctic Division were used for experiments.
Major findings:
(1) Krill facilitates the release of DMS to seawater
DMS concentrations in cultural bottles of growing *Phaeocystis* sp. alone did not change, however, those in cultural bottles of *Phaeocystis* sp. and a living krill increased during 24 hours cultural experiments. This indicates that krill is a node for the DMS release in the ocean.
(2) DMS is released by excretion of krill
DMS concentrations in bottles added krill which stomach was full with phytoplankton increased during 24 hours cultural experiments. Releasing rates of DMS by excretion of krill were faster than those by grazing of krill on *Phaeocystis* sp. DMS seems to be released not only by breaking phytoplankton cells with mandibles of krill, but also by excretion of krill.
(3) Krill has a role as a carrier of DMSP
DMS was much released after once phytoplankton goes through the krill stomach. Krill accumulated DMSP in their guts. Therefore, krill may carry DMSP in their guts and distribute DMS to another sea area from where they graze phytoplankton.

Milestones and deliverables:
Results will be presented at conference talks and papers in progress.
Publications:
Kasamatsu, N., S. Kawaguchi, M. A. J. Curran and M. Fukuchi, Impacts of krill on the Antarctic climate change: how do krill affect the DMS distribution in the Southern Ocean?, in preparation.

Future works:
A comparison DMS releasing rates by krill excretion to those when *Phaeocystis* sp. themselves are dying will be needed to estimate the effect when krill distribute DMSP in the ocean.
The effects of other zooplankton, such as salps and copepods on DMSP dynamics should be evaluated to predict DMS concentrations in the Southern Ocean.

Allocation of SCAR founds:
$4,300 (USD) was awarded to the fellow. The money was transferred to a Japanese bank account and converted into 457, 878 yen (JPY). It was used to cover a 8-week visit to Hobart. 218,391 (JPY) was used for airfare. 127,302 (JPY) was used for accommodation in Hobart. 112,185 (JPY) was used for food, transportation, and some stationeries.