

南極海の酸性化が植物プランクトン(ハプト藻類)におよぼす影響

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Impact estimation of Southern Ocean acidification on calcium carbonate phytoplankton (haptophytes)

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Southern Ocean is one of high biological productive areas in the whole ocean because large amount of primary production is occurred in the seasonal sea-ice zone. Predicted acidification in the sea water would affect on the marine food web particularly on the calcium carbonate phytoplankton such as coccolithopholids. Biological samplings were carried out along 110°E and 140°E in the Indian Sector of the Southern Ocean to represent the coccolithopholids and prymnesiales biomass and to estimate the acidification effects on the phytoplankton communities during the T/V Umitaka-maru cruise in Austral summer of 2011/2012. This study is made as a part of the 53th Japanese Antarctic Research Expedition (JARE-53).

Ocean acidification experiment was carried out 4 times during cruise. Phytoplankton collected by a clean pump at 45°S (Stn C02) and 60°S (Stn C07) of 110°E and 50°S (Stn D13) and 64°S(Stn D07) of 140°E were replaced in around 750 μatm of $p\text{CO}_2$ water to compare the non-acidified natural condition. Each experiment was done for three days. CHEMTAX analysis revealed that diatoms were major component of the phytoplankton in the study area where *Phaeocystis antarctica* was most dominant at northernmost station (C02). Incubation at Stn C02, cell density of haptophytes (coccolithophorales and prymnesiales) was increase 123% under the non-enrichment condition. Cell densities became 331% when Fe was added, however it decreased to 122% under Fe enrich with high $p\text{CO}_2$. Expected ocean acidification would affect on the production of haptopytes particularly most dominant *P. antarctica* and subdominant *E. huxleyi*.

Table 1. Changes in calcium carbonate phytoplankton density (cells L^{-1}) and percent composition (%) at the beginning of natural water (Initial) and obtained national (Contro), Fe enriched (Fe), and Fe enriched with acidified (Fe+CO2) waters after the 3 days incubation at Stn C02 of .15 °S and 110 °E.

Species	Initial	Control	Fe	Fe+CO2	Initial	Control	Fe	Fe+CO2
<i>Calcidiscus leptoporus</i>	124	12,192	18,463	1,623	0.2	14.8	8.3	2.0
<i>Calcidiscus</i> sp.	160	3,646	9,413	18,303	0.2	4.4	4.2	22.5
<i>Emiliana huxleyi</i> typeA	40	1,160	2,533	0	0.1	1.4	1.1	0.0
<i>Emiliana huxleyi</i> typeB	133	798	3,110	0	0.2	1.0	1.4	0.0
<i>Emiliana huxleyi</i> typeC	69	672	1,073	0	0.1	0.8	0.5	0.0
<i>Emiliana huxleyi</i> typeB+C	3,157	18,816	49,890	33	4.7	22.9	22.5	0.0
<i>Gephyrocapsa ericsonii</i>	0	80	200	0	0.0	0.1	0.1	0.0
<i>Gephyrocapsa muelleriae</i>	12	80	67	0	0.0	0.1	0.0	0.0
<i>Pleurochrysis placolithoides</i>	4	128	277	7	0.0	0.2	0.1	0.0
<i>Syracosphaera dilatata</i>	325	120	967	0	0.5	0.1	0.4	0.0
<i>Syracosphaera molischii</i> type1	0	40	200	0	0.0	0.0	0.1	0.0
<i>Umbellosphaera tenuis</i> type II	294	1,218	2,077	660	0.4	1.5	0.9	0.8
<i>Phaeocystis antarctica</i>	62,704	43,200	133,510	60,857	93.6	52.6	60.2	74.7
Total	67,023	82,150	221,780	81,483				