The effect of pCO_2 on size-fractionated phytoplankton community in the Southern Ocean

Shozo Motokawa[1], Hiroshi Hattori[2], Gen Hashida[3], Takahiro Iida[3], Hisashi Endo[4], Hiroshi Sasaki[5] and Satoru Taguchi[1]
[1]*Soka University*
[2]*Tokai University*
[3]*National Institute of Polar Research*
[4]*Hokkaido University*
[4]*Senshu University of Ishinomaki*

We carried out the high pCO_2 manipulation experiments in the Indian Sector of the Southern Ocean during the cruise of the TR/V Umitaka-Maru (Tokyo University of Marine Science and Technology) in the austral summer of 2011/2012. Seawater samples were collected by clean pump from 15m depth at 45°S (St. C02) and 60°S (St. C07) of 110°E, 59°S (St. D13) and 64°S (St. D07) of 140°E. The shipboard incubations were conducted under natural and high pCO_2 conditions for 2 days. For high pCO_2 conditions, triplicate incubation bottles (duplicate incubation at St. C02 and C07) were added with saturated pCO_2 water and regulated around 750 μatm of pCO_2 in the bottles to compare the natural conditions. Size-fractionated pigments of phytoplankton were observed by HPLC. The relative abundance of phytoplankton biomass were estimated by size fractionated chlorophyll *a* (Chl *a*) concentration. The ratio of 19'-hexanoyloxyfucoxanthin (Hex) to Chl *a* (Hex:Chl *a*) and the ratio of Fucoxanthin (Fuco) to Chl *a* (Fuco:Chl *a*) were employed as an index of biomarker of Haptophytes and Diatoms, respectively. Decrease in Hex:Chl *a* under high pCO_2 conditions at St. C02 and D13 suggested the increase in diatoms and the decrease in Haptophytes under high pCO_2 conditions although Chl *a* concentrations seemed to increase without a consistent pattern in the size composition at Sts. C02 and D13 (Table I). Notable increase in Fuco:Chl *a* at St. D07 seemed to be related with the increase in the relative abundance in 20 - 2μm size fractions. Only St. D07 did not respond to the introduction of high pCO_2 in the present study. Those results suggest that nanoplankton community at St. D07, presumably diatoms in the 20 - 2μm size fraction, might be competitive advantage under high pCO_2 condition.

Table I. The average of Chl *a* concentration, Chl *a* composition, the ratio of Fuco to Chl *a*, Fuco to Chl *a* and Hex to Fuco at the natural condition (Control) and high pCO_2 conditions (CO_2) at the end of incubation.

		Chl *a*	Hex : Chl *a*	Fuco : Chl *a*	Chl *a* composition (%)		
		(μmol m^{-3})	(mol mol^{-1})	(mol mol^{-1})	>20 μm	20 - 2 μm	<2 μm
C02	Control	0.22	0.30	0.08	7.6	57.2	35.3
	CO_2	0.26	0.24	0.11	14.0	50.9	35.1
C07	Control	0.70	0.17	0.66	29.9	50.8	19.3
	CO_2	0.70	0.16	0.63	35.6	53.5	10.9
D13	Control	0.39	0.21	0.27	13.4	53.3	33.3
	CO_2	0.44	0.17	0.36	15.8	56.8	27.4
D07	Control	0.65	0.05	0.47	28.5	62.1	9.4
	CO_2	0.65	0.06	0.54	17.0	71.1	12.0

南極海のサイズ別植物プランクトン群集に対する pCO_2 の影響

本川正三[1]、服部寛[2]、橋田元[3]、飯田高大[3]、遠藤寿[4]、佐々木洋[5]、田口哲[1]
[1]*創価大学*、[2]*東海大学*、[3]*国立極地研究所*、[4]*北海道大学*、[5]*石巻専修大学*