# 南極海の混合層の光環境に対するサイズ別植物プランクトン群集の光保護適応

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# Photoprotective acclimation of the size-fractionated natural assemblage of phytoplankton induced by the variable optical depth in the Indian Sector of the Southern Ocean

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Photoprotective acclimation of xanthophyll cycling pigments in the size-fractionated natural phytoplankton assemblage were investigated in the Indian Sector of the Southern Ocean at the austral summer of 2010/2011 and 2011/2012 seasons. The water samples were size-fractionated with 20 μm mesh plankton net cloth. The bulk and <20μm size fractions (nano-size) were filtered on to grass fiber filter (GF/F), and phytoplankton pigments, Chlorophyll *a* (Chl *a*), Didinoxanthin (DD), Diatoxanthin (DT) were measured on HPLC. The pigment concentrations of >20 μm size fractions (micro-size) were estimated by subtracting nano-size from the bulk fraction. Variability in the ratio of xanthophyll cycling pigments such as DD+DT/Chl *a* and DT/DD+DT was determined at three optical depths in mixed layer and deck incubations at surface optical depth. The relationship between the xanthophyll pigment ratios and the surface mixed layer depth (MLD) were examined. The MLD ranged from 22m to 86m which corresponded to the optical depth (ζ) of 1.6 and 4.5, respectively. The DD+DT/Chl *a* decreased in the mixed layer. The average value of DD+DT/Chl *a* were not different between the micro-size and nano-size fractions. The DT/DD+DT were decreased in the mixed layer. The average value of DT/DD+DT of micro-size fraction were larger than those of nano-size fractions. Natural assemblage of micro-size phytoplankton indicated a large variation in DD+DT/Chl *a* in the mixed layer (more than 67%, CV) and deck incubation (more than 130%, temporal variation), suggesting that micro-size phytoplankton might have higher potential for photoprotective acclimation than nano-size phytoplankton. The average and standard deviation of DT/DD+DT at the surface layer were 0.051±0.020 and 0.12 ±0.026 in the large $\zeta_{MLD}$ stations ($\zeta_{MLD}$ >3.5) and the small $\zeta_{MLD}$ stations ($\zeta_{MLD}$ <3.5), respectively. The decrease in DT/DD+DT with the optical depths at MLD ($\zeta_{MLD}$) may suggest that larger variation of light in mixed layer might induce the lower DT/DD+DT at the surface layer regardless of cell size.