An Antarctic terrestrial green alga, *Prasiola crispa*, has an unique red-shifted chlorophyll binding protein which permits large uphill energy transfer

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Prasiola cirspa is one of the dominant terrestrial green algae in Antarctic region, and often constitutes a large sheet-like colony on the soil surface. It was indicated that *P. crispa* harvested in Langhovde of East Antarctica shows a marked absorption band in the far-red light region. Based on an action spectrum of oxygen evolution activity using a large spectrograph facility and measuring P700 photo-responses, it was confirmed that photon energy absorbed by the red-shifted chlorophylls (chls) is transferred not only photosystem I (PS I) but also to photosystem II (PS II). The excitation efficiency in far-red region was as high as that in the visible light region. These results suggested that far-red light absorbed by red-shifted chls can excite PS II reaction center, P680, by an uphill energy transfer. A time-resolved fluorescence spectrum at room temperature showed a long-lifetime fluorescence component at c.a. 720 nm emitted from the red-shifted chls.

We purified the red-shifted chl binding protein (RSC-protein) from thylakoid membranes by sucrose density gradient centrifugation and a DEAE sepharose column chromatography. The purified RSC-protein showed a significant absorption band at 710 nm. We have determined the nucleotide sequence of cDNA by RNA-seq. The partial internal amino acid sequences were determined from fragmented peptides digested by lysyl- end peptidases. It indicated a chloroplast-targetting peptide. The deduced mature protein was found to be a member of light harvesting complex (LHC) family, and showed the highest homology to LHC of *Coccomyxa* subellipsoidea. The notable characteristics observed in this study are linked to an adaptation strategy under the severe environment in Antarctica. (Supported by grant 17K19431 from the Japan Society for the Promotion of Science and grant 151376 from the Sumitomo Foundation.)