アザミサンゴの緑色蛍光タンパク質 ： その機能と色彩多型における役割について

Green fluorescent protein of the coral *Galaxea fascicularis*: its function and role in color polymorphism

Many scleractinian corals exhibit intraspecific variation in their coloration depending on host pigments "fluorescent proteins (FPs)". The coral *Galaxea fascicularis* shows color polymorphisms, which are caused by the different contents and distribution patterns of green fluorescent protein (GFP). The objective of this thesis was to investigate the function of GFP and its role in color polymorphism in *G. fascicularis*. I performed physiological and breeding experiments focusing on two morphs (Gs and B) that exhibit the most different color patterns.

Firstly, to test the potential photoprotective function, I exposed polyps isolated from colonies of two color morphs to medium or strong light (200 and 1000 μmol quanta m^{-2} ms^{-1}) at 26 or 32°C for 6 h. Although the GFP content was markedly different between Gs and B morphs, *in hospite* zooxanthellae in polyps of both morphs showed similar decreases in photochemical efficiency (F_v/F_m) after strong light treatment at normal or high temperature. Isolated zooxanthellae of both morphs also showed similar decrease in the F_v/F_m under light stress, indicating that they had similar tolerance to light stress. The present results suggest that fluorescent protein does not increase the tolerance of polyps to strong light and high temperature stress in *G. fascicularis*.

Secondly, to investigate parental effects on GFP expression of offspring and to study developmental changes in GFP distribution patterns of *G. fascicularis*, I performed breeding experiments between Gs and B morphs. Larvae that developed from B morph eggs showed significantly higher average GFP fluorescence intensity per polyp area than those from Gs morph eggs, regardless of paternal morphotypes. Similarly, juveniles derived from B × B crosses showed higher fluorescence intensity than those derived from Gs × Gs crosses. The GFP pattern changed after settlement: GFP became concentrated around the mouth. No difference in the GFP distribution pattern was observed among crosses. This is the first study to show a possible maternal effect on GFP intensities in coral larvae and juveniles.

Genotypes of host coral and symbionts were determined to understand the relationship among the host mitochondrial DNA (mtDNA) type, the symbiont clade type, and color morphs in *G. fascicularis*. There was no correlation between color morphs and the host mtDNA type or the symbiont clade type, however, the mtDNA type and symbiont clade type were correlated.