Effects of flickering light on the photosynthesis of the coral Acropora digitifera

PG-15 **Effects of flickering light on the photosynthesis of the coral *Acropora digitifera***

中村　崇[1)]・山崎　秀雄[2)]

[1)]琉球大学遺伝子実験センター
[2)]琉球大学理学部

Many shallow-inhabiting corals are frequently exposed to highly variable light conditions. Under a fine weather condition, surface waves can cause considerable heterogeneity in the subsurface light (appears as a glittering pattern) by focusing the solar irradiance, especially in the top few meters of the water. The focusing effect of surface wave eventually enhances subsurface light intensity over 9000 μmol photons $m^{-2}s^{-1}$ with a sub-second time scale Recent studies have shown a strong relationship between excessive PAR (photosynthetically active radiation)-induced photoinhibition of symbiotic algae and subsequent coral bleaching.

In this study, the effects of short-term (1~10 sec) fragmentation of light supply (a combination of a strong light and background weaker light) were examined in terms of symbiotic algal photosynthesis. Although light-fragmentation did not induce significant difference at sub-saturating PAR intensity (80 μmol photons $m^{-2}s^{-1}$) of the symbiotic algae, at super-saturating PAR intensity (500 μmol photons m^{-2} ·sec^{-1}), light fragmentation caused significantly less dynamic photoinhibition compared with continuous application in the shallow-inhabiting reef-building coral *Acropora digitifera.* Furthermore, light fragmentation effectively reduced dynamic photoinhibition under high water-temperature conditions. We suggest that high frequency in weak/strong light fluctuation in the shallow reef area (especially at calm lagoon and tide pools) poses significant effects on photosynthesis in coral-algae symbiosis, especially during high sea surface temperature conditions.

Keywords: Coral, Photoinhibition, Light flicker, wave-focusing