

## Inter-colonial variation of environmental response in *Porites australiensis*

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Okinawan coral reefs are located at relatively high latitude area among the global distribution of coral reefs. Since main island of Okinawa is placed near the northernmost part of coral reef area, corals may experience their lower temperature thresholds for their growth. Okinawa is characterized by its sub-tropical climate where the seasonal weather change should influence the physiology of corals. For example, corals inhabit shallow reef environment display their stress response as bleaching during the high temperature period in the summer. Thus, corals may be exposed to lower as well as upper thermal thresholds. In this study, we aimed to reveal the dynamic response of coral physiology as well as growth trend in response to changing environment due to seasonal weather. We employed a continuous monitoring experiment under the outdoor aquarium conditions. We also intended to focus on the variation of responses among colonies. The experiments were carried out during the period of September 2007 to April 2010 at the Sesoko Research Station, University of the Ryukyus. 16 colonies originated from 8 mother colonies of shallow-inhabiting *Porites australiensis* were used in the experiment. Water temperature and irradiance level were recorded by data-loggers. Simultaneously, in order to monitor the dynamic change in symbiotic algal photosynthesis, we measured photosynthetic parameters ( $F_v/F_m$ , ETR, NPQ) by PAM chlorophyll fluorescence method. In addition, we estimated growth rate of colonies by underwater buoyant weight method. There are annual changes in photosynthetic efficiency observed with seasonal variation of light and temperature conditions. The result suggests the strong impact of seasonal environmental changes on the physiology of *P. australiensis*. Relative growth rates are declined during the winter whereas it increased in the summer. The variation of photosynthetic efficiencies can be categorized into three groups. Colony growth rates were greater in colonies with lower photosynthetic variance whereas low growth rates were observed in the colonies with high photosynthetic variance. The average photosynthetic efficiency correlated with growth. Although it is not clear both host animal or symbiotic algae responsible for such variations, these results indicate that there are at least several groups of *P. australiensis* inhabit in shallow reef area of Okinawa.

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