



## **Coral sclerochronology and geochemistry in mesophotic corals: environmental or physiological changes?**

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Mesophotic coral ecosystem at depth ranging from 30 m to 150 m, is still unexplored for its environmental changes and the strategy of coral adaptation. Massive *Porites* corals are principal reef builder and powerful paleoenvironmental recorder in Indo-Pacific. We found *Porites* corals surviving at 40 m depth around Sesoko Island, Okinawa, Japan, and examined their skeletal growth and the availability of representative geochemical proxies, Sr/Ca ratios and stable isotopes ( $\delta^{18}\text{O}$ ,  $\delta^{13}\text{C}$ , and  $\delta^{15}\text{N}$ ). We collected *Porites* coral colonies one each from 4m and 15m depth, and two from 40 m depth. Coral skeletal growth rates, densities, and calcification rates were estimated from x-radiographs calibrated with density standards made from giant clam shells. Sr/Ca ratios were measured by ICP-AES. Oxygen and carbon isotope measurements were performed by IRMS coupled with the carbonate device. Nitrogen isotope measurement was performed with chemical conversion methods established by Yamazaki et al (2011), and converted from organic nitrogen to  $\text{N}_2\text{O}$  gas introduced to CF-IRMS. *Porites* colony shapes and growth rates are extremely changing to flat and slow with depth. Sr/Ca ratios showed distinct seasonal cycles and recorded seawater temperatures even at 40 m depth. Oxygen and carbon isotope ratios suggested influence from the coral skeletal growth rates. Nitrogen isotopes suggested trophic changes often occurred at 40 m depth. Photosynthesis and nutrient assimilation by symbiotic algae are important for calcification and metabolic system for reef corals. Mesophotic environments in darker condition than the shallow reefs corals, but *Porites* corals adapt to the lower light availability with changing their colony shape with skeletal components and switching heterotrophy, but still record seawater temperatures. Coral sclerochronology have a possibility to investigate environment and coral physiological changes in mesophotic zone.