

THE EFFECT OF TEMPERATURE AND LIGHT ON THE
STABLE ISOTOPIC COMPOSITION OF REEF CORAL SKELETONS

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ABSTRACT

The reef corals Pocillopora damicornis and Montipora verrucosa were cultured under various controlled temperatures and light conditions at Ulupau Head Microcosm facility. The skeletal carbonate deposited under different experimental regimes was analyzed for ^{13}C and ^{18}O . Coral skeletal $\delta^{13}\text{C}$ values varied with light dose and correlated with changes in zooxanthellar pigment. The $\delta^{13}\text{C}$ value of skeletal aragonite seems to be controlled by oxidation of photosynthetically produced organic matter.

Functionally significant relationships between coral skeletal $\delta^{18}\text{O}$ values and temperature have been determined. The temperature coefficients of the $\delta^{18}\text{O}$ values (-4.20) are the same as the first order coefficient in the equilibrium paleotemperature equation, but the $\delta^{18}\text{O}$ values have species-specific offsets from equilibrium. These offsets may be attributed to the activity of the coral's zooxanthellae. Based upon the results of this study a model of coral skeletal isotopic incorporation is presented.