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TITLE: Refining the sampling approach for the massive coral *Diploastrea heliopora* for $\delta^{18}\text{O}$ -based paleoclimate applications

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ABSTRACT:

Studies on the Indo-Pacific coral *Diploastrea* have demonstrated that this genera can potentially be used to generate multi-century length climate reconstructions, however some concerns remain regarding sampling protocols. This study further explores the utility of *Diploastrea heliopora* for paleoclimatic reconstructions by examining $\delta^{18}\text{O}$ along short coral cores of *D. heliopora* and *Porites lutea* from Kandavu, Fiji. These results indicate that sampling of the columellar part of the corallite in *D. heliopora* is optimal to capture the full annual $\delta^{18}\text{O}$ cycle and that bi-monthly (0.5 mm) sampling resolution is the optimal temporal resolution for the Kandavu *D. heliopora*. Results from Kandavu *D. heliopora* show high intra-core reproducibility as well as a significant correlation to a $\delta^{18}\text{O}$ record from a nearby *Porites* colony (monthly resolution: $r = 0.71$, $n = 186$, $df = 54$, $p = 0.01$; annual resolution: $r = 0.59$, $n = 16$, $df = 16$, $p = 0.01$). At our Fiji study site, *D. heliopora* and *Porites* skeletal $\delta^{18}\text{O}$ have similar sensitivities to sea surface temperature and sea surface salinity, validating the approach of using both coral species to create robust climate reconstructions. These results indicate that microanalyses of the columellar portion of *D. heliopora* skeleton produce time-series $\delta^{18}\text{O}$ results similar in quality to that extracted from *Porites*.

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