

Coral reef calcification estimates at One Tree Island, Great Barrier Reef: Evidence for ecosystem recovery

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Estimates of coral reef ecosystem calcification (G_{net}) and productivity (P_{net}) provide insight into coral community health and functionality in response to short- and long-term stressors such as ocean warming and acidification. Here, we investigate spatial variability in calcification and organic production at One Tree Island (OTI) and compare our new observations to sporadic metabolic rates reported over the previous 50 years on the same reef flat. G_{net} and P_{net} estimates at the nearshore site were 55% and 112% lower than an offshore site with a shift in organic production from net productive to net respiratory. Contrary to expectations, calcification rates in 2017 ($140.6 \pm 3.4 \text{ mmol m}^{-2} \text{ d}^{-1}$) were comparable to the 1970's estimate ($125.0 \pm 12.5 \text{ mmol m}^{-2} \text{ d}^{-1}$) and > 190% greater than similar observations in 2014. Our results indicate only weak associations between G_{net} and aragonite (Ω_{ar}) with no clear influence at any of the sites. A local increase in coral cover was the likely driver of increased calcification. Overall, these results highlight the importance of site selection and replication when comparing metabolic datasets, and demonstrate major short-term variability in metabolic rates. Predictive capabilities of ecosystem metabolism studies may be constrained by using the available short-term datasets to represent long-term calcification trends.