Sensitivity of Calcification to Thermal Stress Varies among Genera of Massive Reef-Building Corals

Juan P. Carricart-Ganivet[1,2*], Nancy Cabanillas-Terán[2], Israel Cruz-Ortega[1], Paul Blanchon[1]

1 Unidad Academica de Sistemas Arrecifales, Instituto de Ciencias del Mar y Limnologıa, Universidad Nacional Autónoma de México, Puerto Morelos, Quintana Roo, México, 2 Unidad Chetumal, El Colegio de la Frontera Sur, Chetumal, Quintana Roo, Mexico

Reductions in calcification in reef-building corals occur when thermal conditions are suboptimal, but it is unclear how they vary between genera in response to the same thermal stress event. Using densitometry techniques, we investigate reductions in the calcification rate of massive *Porites* spp. from the Great Barrier Reef (GBR), and *P. astreoides*, *Montastraea faveolata*, and *M. franksi* from the Mesoamerican Barrier Reef (MBR), and correlate them to thermal stress associated with ocean warming. Results show that Porites spp. are more sensitive to increasing temperature than *Montastraea*, with calcification rates decreasing by 0.40 g cm^{-2} $year^{-1}$ in Porites spp. and 0.12 g cm^{-2} $year^{-1}$ in *Montastraea* spp. for each $1^{o}C$ increase. Under similar warming trends, the predicted calcification rates at 2100 are close to zero in *Porites* spp. and reduced by 40% in *Montastraea* spp. However, these predictions do not account for ocean acidification. Although yearly mean aragonite saturation (Ω_{ar}) at MBR sites has recently decreased, only *P. astreoides* at Chinchorro showed a reduction in calcification. In corals at the other sites calcification did not change, indicating there was no widespread effect of Ω_{ar} changes on coral calcification rate in the MBR. Even in the absence of ocean acidification, differential reductions in calcification between *Porites* spp. and *Montastraea* spp. associated with warming might be expected to have significant ecological repercussions. For instance, *Porite*s spp. invest increased calcification in extension, and under warming scenarios it may reduce their ability to compete for space. As a consequence, shifts in taxonomic composition would be expected in Indo-Pacific reefs with uncertain repercussions for biodiversity. By contrast, *Montastraea* spp. use their increased calcification resources to construct denser skeletons. Reductions in calcification would therefore make them more susceptible to both physical and biological breakdown, seriously affecting ecosystem function in Atlantic reefs.

Carricart-Ganivet JP, Cabanillas-Teraa´ n N, Cruz-Ortega I, Blanchon P (2012) Sensitivity of Calcification to Thermal Stress Varies among Genera of Massive Reef-Building Corals. PLoS ONE 7(3): e32859. doi:10.1371/journal.pone.0032859