Abstract for ScholarOne

Anthropogenic climate change is a rapidly intensifying selection pressure on biodiversity across the globe and, particularly, on the world’s coral reefs. The rate of adaptation to climate change is proportional to the amount of phenotypic variation that can be inherited by subsequent generations (i.e., narrow-sense heritability, <i>h<sup>2</sup></i>). Thus, traits that have higher heritability (e.g., <i>h<sup>2</sup></i> > 0.5) are likely to adapt to future conditions faster than traits with lower heritability (e.g., <i>h<sup>2</sup></i> < 0.1). Here, we synthesize 95 heritability estimates across 19 species of reef-building corals. Our meta-analysis reveals low heritability (<i>h<sup>2</sup></i> < 0.25) of gene expression metrics, intermediate heritability (<i>h<sup>2</sup></i> = 0.25–0.50) of photochemistry, growth, and bleaching, and high heritability (<i>h<sup>2</sup></i> > 0.50) for metrics related to survival and immune responses. Some of these values are higher than typically observed in other taxa, such as survival and growth, while others were more comparable, such as gene expression and photochemistry. There was no detectable effect of temperature on heritability, but narrow-sense heritability estimates were generally lower than broad-sense estimates, indicative of significant non-additive genetic variation across traits. Trait heritability also varied depending on coral life stage, with bleaching and growth in juveniles generally having lower heritability compared to bleaching and growth in larvae and adults. These differences may be the result of previous stabilizing selection on juveniles or may be due to constrained evolution resulting from genetic trade-offs or genetic correlations between growth and thermotolerance. While we find no evidence that heritability decreases under temperature stress, explicit tests of the heritability of thermal tolerance itself – such as coral thermal reaction norm shape – are lacking. Nevertheless, our findings overall reveal high trait heritability for the majority of coral traits, suggesting corals may have a greater potential to adapt to climate change than has been assumed in recent evolutionary models.