

High latitude corals on the move: a comparative heat wave assessment

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Abstract

Climate-change induced tropicalisation of temperate marine communities has been recently advanced as one of the major consequences of seawater temperature increase. The resulting changes could have severe and long lasting consequences for ecosystem functioning and associated services and it is thus becoming increasingly important to detect and predict. A recent heatwave in 2011 has reshaped marine communities at the warmer range of temperate systems in Western Australia (central-west region). These warming anomalies have resulted in a decrease in canopy-forming seaweeds with cold-water affinity and an increase in warm-water fish species, suggesting a tropicalisation of the marine system. However, it is still undetermined whether the heatwave has altered sessile invertebrates and most importantly coral communities, which are the foundation species in most of tropical marine environments (also found in higher latitudes). Here we proposed to investigate this tropicalisation hypothesis and compare pre- and post-heatwave coral communities thanks to transect data from 2006 and 2013. Post heatwave data was gathered by repeating the experimental methods and design of a 2006 survey (Western Australian Museum). We found that contemporary biogeographic patterns generally conformed to latitudinal gradients. Temporal analysis of community structure revealed change between 2006 and 2013. Unexpectedly this changes was the result of increases in predominantly temperate species. Species of tropical affinity, such as *Acropora millepora* were new presence recordings compared to 2006, however they may have recruited before the heat wave. We also found that there was a two-fold increase in the abundance of corals since 2006, which was mainly due to a greater abundance of *Plesiastrea versipora*. This increase corresponded with a large number of small *P. versipora* individuals at most sites suggesting a flux of recruitment between 2006 and 2013. This demonstrates that coral communities have changed significantly between 2006-2013 and this is likely due to facilitation from the warming during the marine heatwave. However, we still don't know if the increase in recruitment and change in coral communities are the consequences of a direct positive effect of warming on coral spawning and recruitment success or the indirect effect of competitive exclusion release with macro algae.

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