

Trends in the abundance of picophytoplankton due to changes in boundary currents and by marine heat waves in Australian coastal waters from IMOS National Reference Stations

The picophytoplankton, *Prochlorococcus* and *Synechococcus*, are small photosynthetic cells (< 3µm diameter) important in the world's tropical oceans. With a large surface area to volume ratio these cells are very responsive to their environment, and their distribution and abundance make them good indicators of variability in our coastal oceans. To understand change in Australian waters, we used flow cytometry to analyse monthly samples of picophytoplankton (2009 - 2017) from 2 Integrated Marine Observing System (IMOS) National Reference Stations (NRS) in southern Australia. We found clear seasonal patterns in abundance from Rottnest Island (Western Australia) and Maria Island (Tasmania) due to seasonality in flows of the Leeuwin and East Australian Currents. However, our data also shows that the abundance of the tropical picophytoplankton in southern Australian waters is increasing due to strengthening boundary currents and more intense eddies on the east coast and through the effects of marine heat waves on the west coast. This is significant as it points to fundamental changes in the size and community composition of phytoplankton at the base of the marine food chain. Our data also highlight how sustained ocean biodiversity observations help us understand our changing oceans.

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