MEASO18
Marine Ecosystem Assessment for the Southern Ocean

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Ocean acidification changes Antarctic marine microbial community composition and trophic interactions

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High-latitude oceans are anticipated to be some of the first regions affected by ocean acidification. Despite this, the effect of ocean acidification on natural communities of Antarctic marine microbes is poorly understood. Coastal Antarctic waters are regions of high productivity, that provide an essential food source for the abundance of life in Antarctica. Marine microbes are an essential part of this marine food web and are a critical link in biogeochemical processes, such as the cycling of nutrients and carbon. While large phytoplankton, such as diatoms and dinoflagellates, are often believed to be responsible for the most of the energy transfer to higher trophic levels, smaller picophytoplankton, bacteria, and heterotrophic nanoflagellates (HNF) also play important roles in the microbial loop, through nutrient remineralisation and grazing.

A recent study was carried out at Davis Station, East Antarctica to investigate the effect of ocean acidification on the marine microbial community. In this study we exposed an early spring, coastal marine microbial community in Prydz Bay to CO2 levels ranging from ambient (343 µatm) to 1641 µatm in six 650 l minicosms. At CO2 levels ≥ 634 µatm, a significant change in the community composition was observed with declines in the abundance of large diatoms (>20 µm), Phaeocystis antarctica, and HNF. This led to a dominance of small diatoms (<20 µm) in the high CO2 treatments. The CO2-related decline in HNF abundance at levels ≥634 µatm also correlated to an increase in both picoeukaryote (<2 µm) and bacterial abundance, suggesting that grazing control was stronger on communities at CO2 levels ≤506 µatm. This suggests that there is likely to be a significant change in near-shore microbial communities near the end of this century if anthropogenic CO2 release continues unabated, with profound ramifications for near-shore Antarctic ecosystem food-webs and biogeochemical cycling.

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Department of the Environment and Energy
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