Quantification of benthic biodiversity and biomass in time, space and changes with season at an Antarctic site

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Climate change is increasingly emerging as one of the major threats to biodiversity, especially in the polar regions. The composition and distributions of marine assemblages are being altered directly and indirectly by rapid recent climate forcing. Of particular importance are those regions of the globe that are changing the fastest such as the polar coasts. Antarctic coastal benthic communities are considered to be especially climate sensitive due to their high regional heterogeneity and uniqueness (endemicity).

This study aims to quantify long term change (1998 -2015) in marine benthic biodiversity at a coastal Antarctic site and describe the first Antarctic seasonal study of shallow water biodiversity and biomass. Repeating and improving a protocol from 1998 all benthic organisms >3mm in size within 0.25m^2 quadrats were collected at 6m, 12m and 20m depths near Rothera Point, Adelaide Island, West Antarctic Peninsula. However, the current study additionally performed this during both the austral summer and winter, (of 2015) and at three different transects to gage temporal and special variability.

Organisms were identified to the lowest possible taxonomic unit and their wet, dry and ash free dry masses obtained. We identified considerable reductions in biodiversity, particularly a loss of sessile organisms. The greatest change occurred at 12m where faunal density, richness and diversity declined significantly. Benthic community structure and biomass (measured as Ash Free Dry Mass) did not vary seasonally. The lack of significant seasonal difference in biodiversity and biomass suggest that benthic fauna are not strongly affected or are able to cope with the winter decrease in primary production. The reduction in shallow water biodiversity over time is likely to be caused by an increased frequency of iceberg disturbance (a knock on effect of fast ice losses). Ongoing climate change in the coming decades is likely to drive more ice scour at the poles, through both reduced fast ice allowing more movement of existing icebergs and retreating glaciers producing more icebergs.

Keywords: Antarctica; benthic; biodiversity; biomass; coastal shallows; depth; seasonality; Western Antarctic Peninsula