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The effect of ocean acidification and freshening induced by meltwater input on the Antarctic limpet *Nacella concinna* in Marian Cove, King George Island

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Antarctic organisms with long lifespans and slow growth can respond to rapid environmental changes through phenotypic plasticity. In particular, meltwater input from glaciers and snowfields, induced by ocean warming, is increasing in the Western Antarctic Peninsula, leading to ocean acidification and freshening. Antarctic limpets *Nacella concinna*, known to be vulnerable to climate change, are expected to have unique mechanisms to deal with climate changes since they live in rocky intertidal zone where environmental conditions including temperature, salinity, and pH fluctuate. We aimed to assess the acclimation or adaptive potential of *N. concinna* to ocean acidification and freshening caused by meltwater input. We hypothesized that Antarctic limpets would exhibit phenotypic plasticity in response to these environmental changes. To test the hypothesis, we exposed the Antarctic limpets to one of four different treatments for 30 days: control (pH 8.0, 34 psu), low pH (pH 7.6, 34 psu), low salinity (pH 8.0, 27 psu), or a combination of low pH and low salinity (pH 7.6, 27 psu). Following 30-day exposure, we evaluated physiology, behavior, and shell integrity. pH and salinity did not affect mortality and condition factor. Righting responses increased under low pH. Additionally, low pH induced shell dissolution while shell thickness ratio, Ca content, and mechanical properties remained unchanged. These results suggest that ocean acidification and freshening do not impact on survival of Antarctic limpets. However, long-term exposure to low pH and low salinity may threaten the survival of *N. concinna* by compromising the shell integrity.