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Calcification and carbonate dissolution of an Arctic coralline red algae exposed to ocean acidification

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CO_2 induced acidification could render Arctic waters sub-saturated in the coming decades, making them corrosive for calcareous organism. It is presently unknown what effects this will have on calcifying organisms living in the Arctic Ocean and on the ecosystems of which they are integral components. We investigated calcification rates of the Arctic habitat-forming coralline red alga *Lithothamnion tophiforme* in laboratory experiments simulating future atmospheric CO_2 concentrations. Algae were tested under Arctic summer and winter light conditions in two separate experiments. A significant negative effect of increased CO_2 levels on the calcification rates of *L. tophiforme* was found in both experiments. Annual mean net dissolution of *L. tophiforme* is estimated to start at an aragonite saturation state of 0.8 which is projected to occur in parts of the Arctic surface ocean before 2050 if emissions follow business as usual scenarios. Coralline red algae consist to more than 80% of calcium carbonate and are most likely unable to withstand natural stresses such as water movement, overgrowth or grazing without their massive skeleton. Based on our results a wide-spread loss of Arctic crustose coralline red algae habitats may occur during this century potentially impacting the Arctic ecosystem.