MORPHOLOGICAL AND PHYSIOLOGICAL EFFECTS IN *PROBOSCIA ALATA* (BACILLARIOPHYCEAE) GROWN UNDER DIFFERENT LIGHT AND CO_2 CONDITIONS OF THE MODERN SOUTHERN OCEAN.

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The combined effects of different light and aqueous CO_2 conditions were assessed for the Southern Ocean diatom *Proboscia alata* (Brightwell) Sundström in laboratory experiments. Selected culture conditions (light and $CO_{2(aq)}$) were representative for the natural ranges in the modern Southern Ocean. Light conditions were 40 (low) and 240 (high) µmol photons·m^{-2}·s^{-1}. The three $CO_{2(aq)}$ conditions ranged from 8 to 34 µmol·kg^{-1} $CO_{2(aq)}$ (equivalent to a pCO_2 from 137 to 598 µatm, respectively). Clear morphological changes were induced by these different $CO_{2(aq)}$ conditions. Cells in low [$CO_{2(aq)}$] formed spirals, while many cells in high [$CO_{2(aq)}$] disintegrated. Cell size and volume were significantly affected by the different $CO_{2(aq)}$ concentrations. Increasing $CO_{2(aq)}$ concentrations led to an increase in particulate organic carbon concentrations per cell in the high light cultures, with exactly the opposite happening in the low light cultures. However, other parameters measured were not influenced by the range of $CO_{2(aq)}$ treatments. This included growth rates, chlorophyll a concentration and photosynthetic yield (F_v/F_m). Different light treatments had a large effect on nutrient uptake. High light conditions caused an increased nutrient uptake rate compared to cells grown in low light conditions. Light and CO_2 conditions co-determined in various ways the response of *P. alata* to changing environmental conditions. Overall *P. alata* appeared to be well adapted to the natural variability in light availability and $CO_{2(aq)}$ concentration of the modern Southern Ocean. Nevertheless, our results showed that *P. alata* is susceptible to future changes in inorganic carbon concentrations in the Southern Ocean.