

**The effects of elevated oxygen
levels on carbon isotopic fractionation
in the marine diatom
Phaeodactylum tricornutum.**

Rebecca Lane

Senior thesis

May 12, 2000

Abstract

The carbon isotopic composition of the marine diatom *Phaeodactylum tricornutum* ($\delta^{13}\text{C}$) was measured over a series of continuous culture systems with a constant growth rate (μ) and varying O_2/CO_2 ratios. The $\delta^{13}\text{C}_{\text{CO}_2}$ and $[\text{CO}_2]_{\text{aq}}$ were determined for each system. By comparing the fractionation (ϵ_p) to the μ/CO_2 it is shown that there is still a relationship between the two factors. The $\mu/\text{CO}_2(\text{aq})$ ranged from 0.030 to 0.163 $\text{kg mol}^{-1} \text{d}^{-1}$ and ϵ_p ranged from 21.74 to 24.48. The results from this experiment show that high levels of O_2 affect the carbon isotopic fractionation in *Phaeodactylum tricornutum*. It was shown that there was a variation in the $\delta^{13}\text{C}_{\text{CO}_2}$ with the change in O_2/CO_2 ratios. One likely explanation for the variation in fractionation could be due to the fixation of the ^{13}C depleted CO_2 formed during photorespiration. Further research would be required to ensure that photorespiration was the cause of the variation in $\delta^{13}\text{C}_{\text{CO}_2}$.