

Interactive effects of temperature, CO₂ and nitrogen source on a coastal California diatom assemblage

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Abstract

Diatoms are often considered to be a single functional group, yet there is a great deal of morphological, genetic and ecological diversity within the class. How these differences will translate into species-specific responses to rapid changes in the ocean environment resulting from climate change and eutrophication is currently poorly understood. We investigated the response of a natural diatom-dominated assemblage in coastal California waters to interactions between the variables nitrogen source (nitrate and urea), temperature (19 and 23°C) and CO₂ (380 and 800 ppm) in a factorial experimental matrix using continuous culture (ecostat) methods. The community included diatoms of the cosmopolitan genera *Pseudo-nitzschia* and *Chaetoceros*, as well as *Leptocylindrus* and *Cylindrotheca*. Our results demonstrate strong interactive effects of these variables on community composition; notably, nitrogen source alone and nitrogen and CO₂ together had a much greater influence on diatom community structure at 23°C compared with 19°C. In addition, warming and

acidification interactions significantly increased cellular quotas of the neurotoxin domoic acid produced by *Pseudo-nitzschia multiseriata*. In general, the effects observed for the factors tested differed significantly between the various diatom genera in this assemblage, suggesting potentially divergent responses of some of these ecologically and biogeochemically important phytoplankton taxa to interactions between global-scale and local-scale anthropogenic stressors in a changing ocean.

Issue Section:

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