

Positive Effects of Hypoxia and Increasing Atmospheric CO₂ on Bloom-Forming *Noctiluca scintillans*

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Noctiluca scintillans (*Noctiluca*) is a large, marine, mixotrophic dinoflagellate measuring .5mm-1mm in diameter. Before the 1990's *Noctiluca* was not a very prominent organism, however, in the past couple of decades it has been taking over the plankton trophic level of the Arabian Sea and severely restructuring its ecosystem. Since 2000 *Noctiluca* has been causing increasingly intense blooms in the Arabian Sea during the summer and winter. *Noctiluca*'s mixotrophic lifestyle makes it very resourceful but also incredibly challenging to understand. Past studies have separately indicated that *Noctiluca* benefits from the spread of hypoxia in the Arabian Sea and increasing atmospheric CO₂ levels. The purpose of my experiment is to study the combined effects that increasing atmospheric CO₂ and low oxygen levels have on the physiology and abundance of *Noctiluca*. In this experiment we exposed *Noctiluca* to artificial atmospheres of varying CO₂ and O₂ levels: 280ppm CO₂ (9ppm O₂), 400ppm CO₂ (6ppm O₂), 800ppm CO₂ (2ppm O₂), representing preindustrial, ambient, and projected end-of-the-century levels of CO₂, respectively, accompanied by decreasing levels of oxygen. Our results indicate that *Noctiluca* performs best under 800ppm CO₂ and 2ppm O₂ conditions, supporting our current hypothesis that its endosymbiont, *Protoeuglena noctilucae*, compliments *Noctiluca* well because of its evolution 1.2 Ga ago under similar, high-CO₂, low-O₂ conditions. Our results also differ significantly from a previous study done in our laboratory studying solely the effects of increasing atmospheric CO₂, indicating that the spread of hypoxia in the Arabian Sea has important implications regarding *Noctiluca*. These findings suggest that as atmospheric CO₂ continues to rise and the globe continues to warm, *Noctiluca* blooms will intensify and continue to disrupt the ecosystem and resources of the Arabian Sea.